# The American Journal of Surgery

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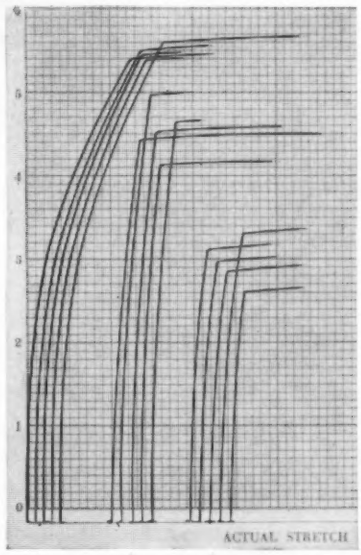


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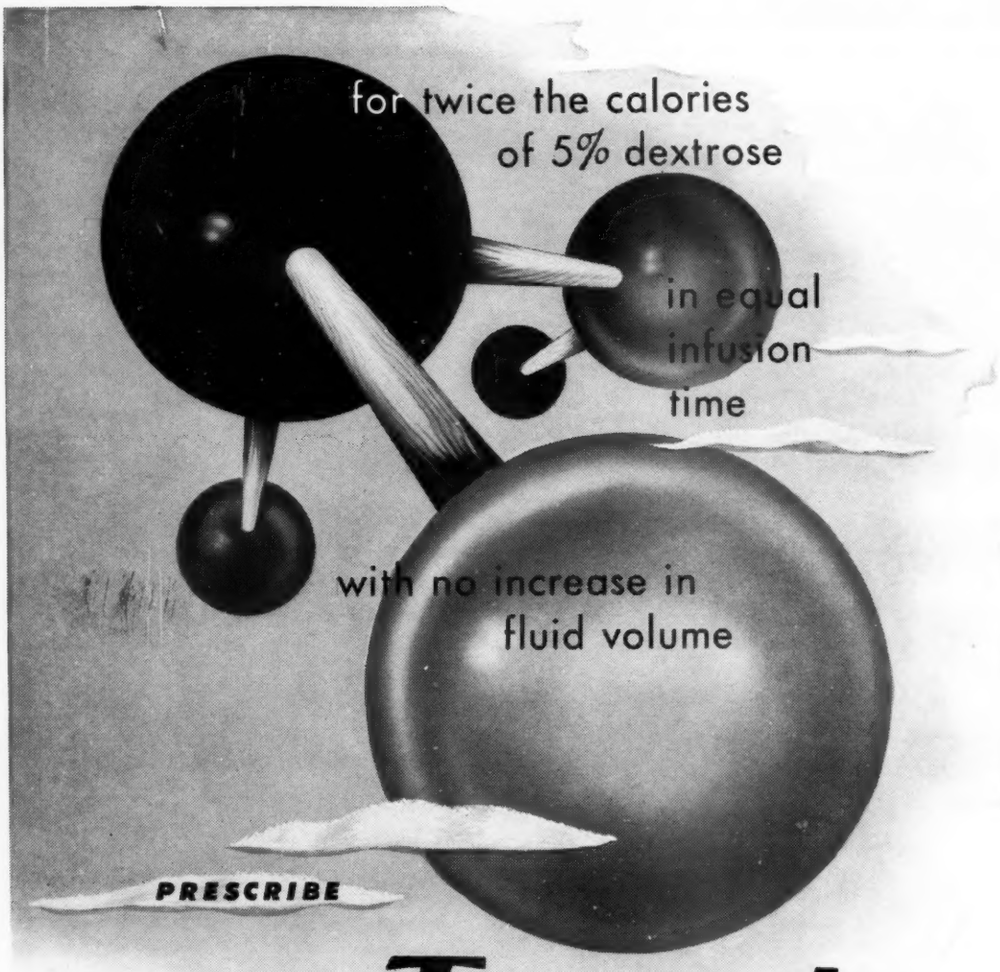


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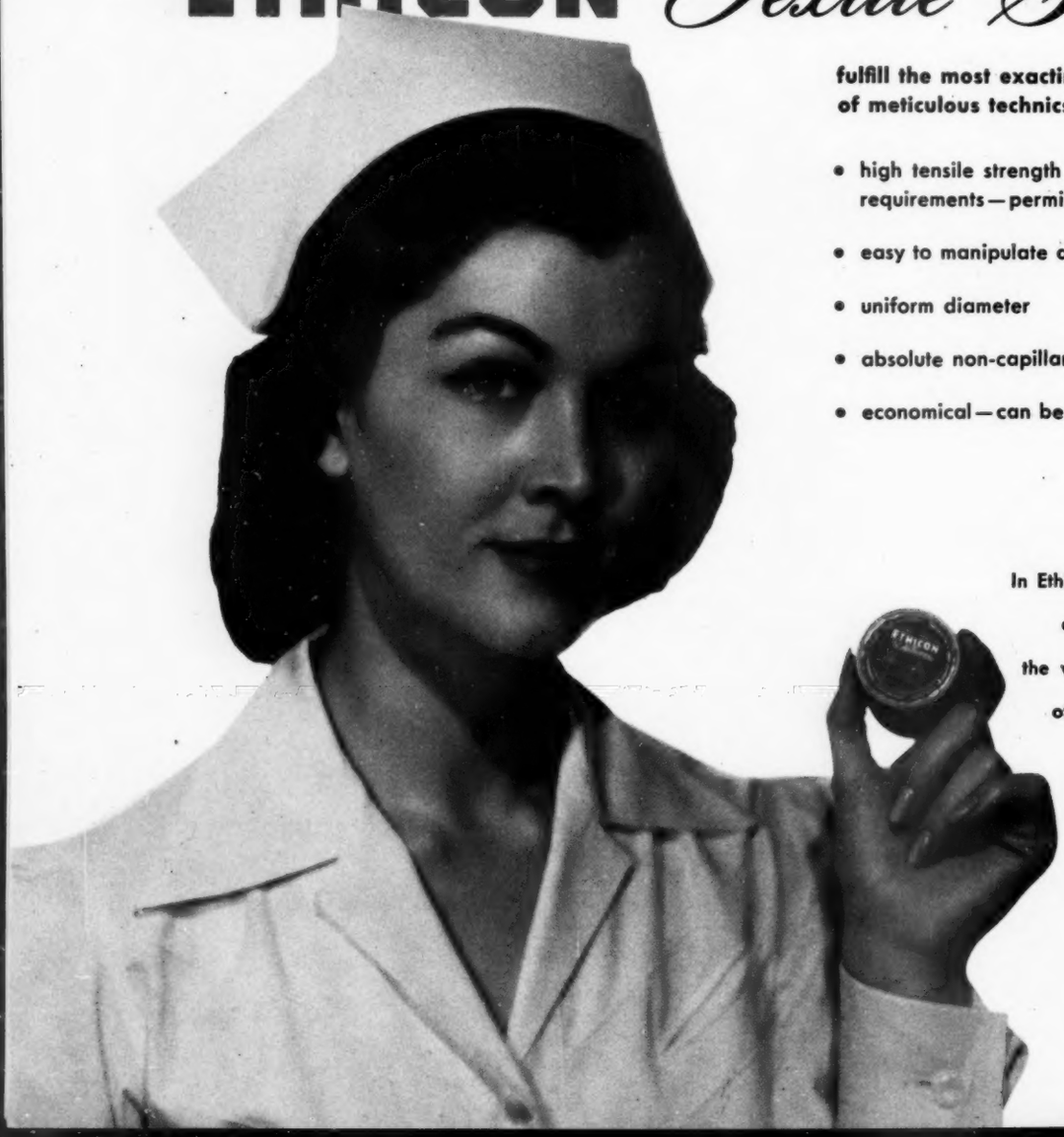

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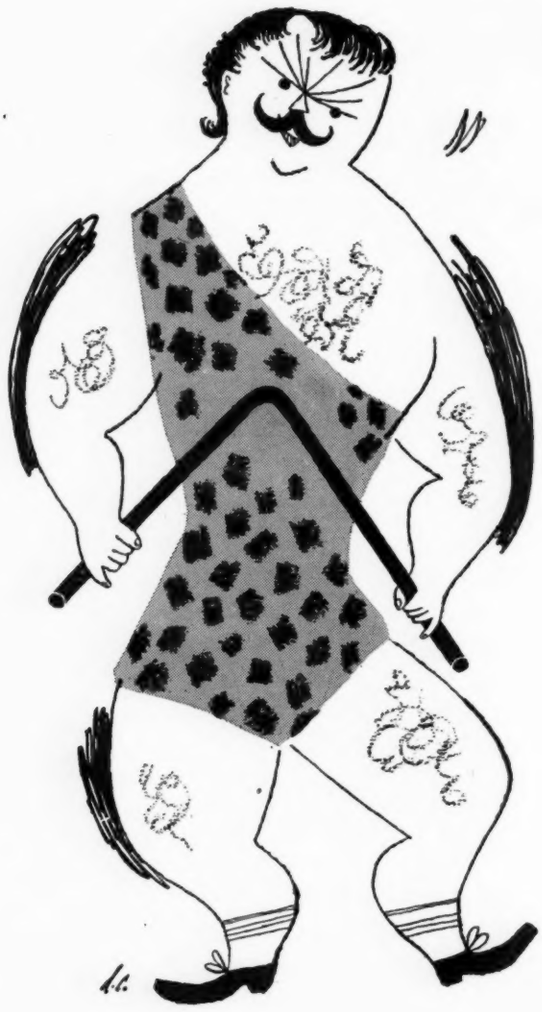

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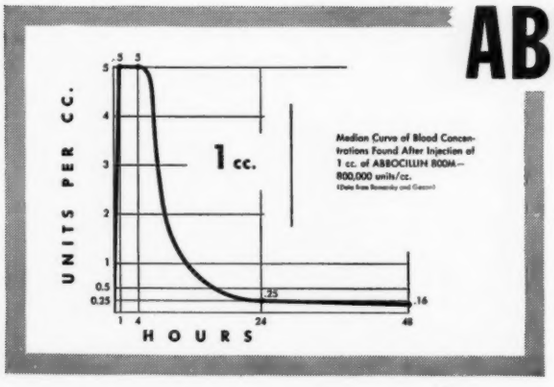


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## Restoring Fluid Volume

Plasma infusions, and transfusions of whole blood, often make it possible to restore the circulatory volume satisfactorily without further ado. Sometimes the regulation of water and salt intake will bring about a satisfactory adjustment. Sometimes not. Sometimes all of these measures fail; under certain conditions, it becomes difficult or practically impossible to achieve a satisfactory response without repeated infusions, time after time, or the use of additional measures and long-continued treatment.

## Practical Problems

The problems of management are complicated by the fact that blood volume is difficult to measure accurately, and because there are no simple guides for determining what volume is "normal" for the individual to begin with. "The best that one can do," according to a recent report by *Price*, "is to say that normal active human adults, with average physiques, have plasma volumes equivalent to between 4 and 5 per cent of the body weight and hematocrit values for venous blood of 40 to 50 per cent."[1] *Price* notes that *Noble and Gregersen*[2] and *Gibson and Evans*[3] "have found the range of variation in groups of healthy men and women actually to be much greater than that." *Price* points out that calculations of *blood volume* from the *body weight* are only rough estimates, and that they may be misleading because there is no definite or constant ratio between body weight and total blood volume.[1]

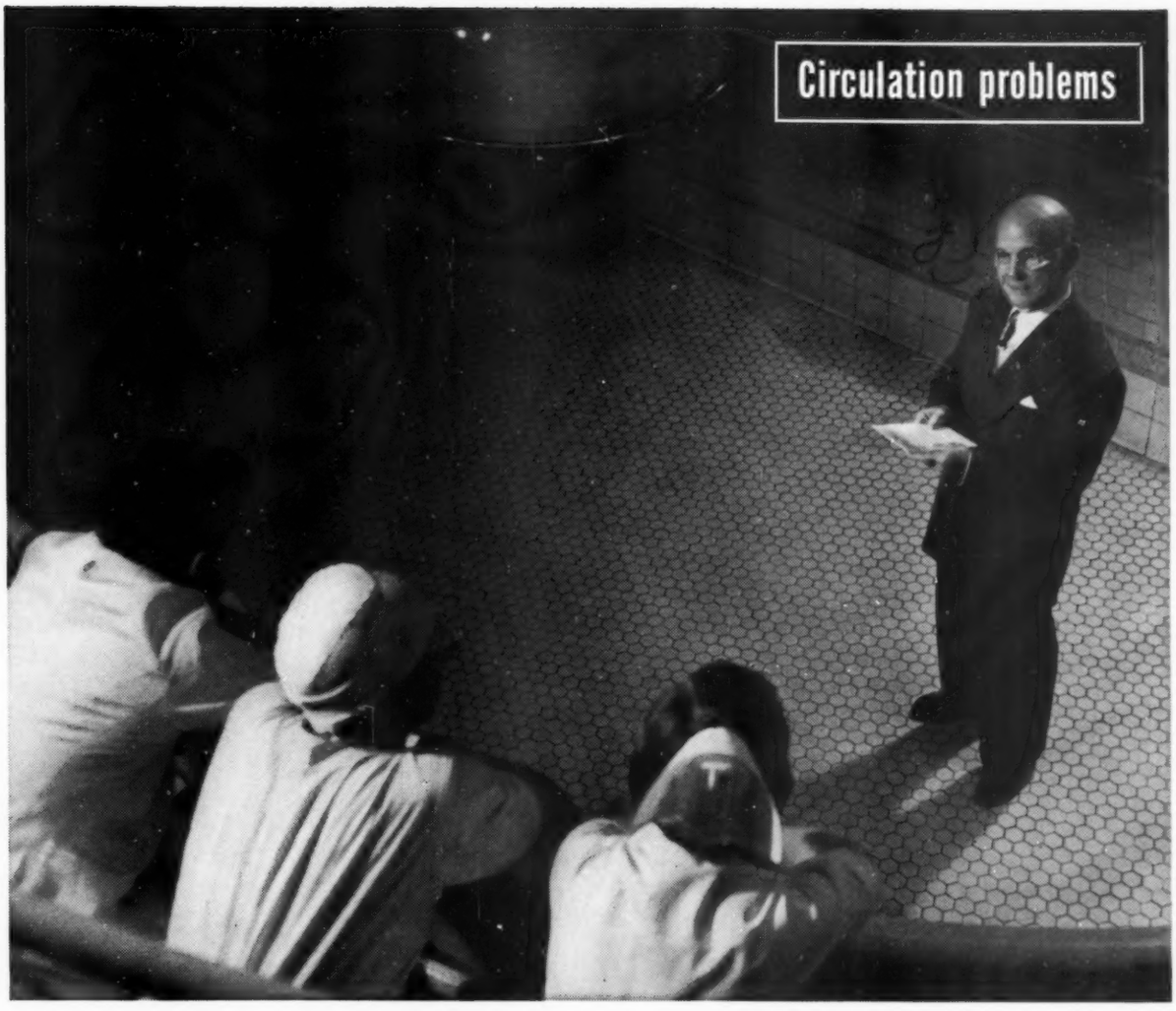
## Theoretical Problems

Control of blood volume is further complicated by the number of physiologic mechanisms involved, their conflicting influences, and our imperfect understanding of the factors themselves—and the ways in which they bring about a dynamic equilibrium. Studies on the anterior-pituitary *adrenocorticotropic hormone* (ACTH), and the *adrenal cortex hormones*, promise to clarify some of the problems. Other studies that have a bearing on this subject are those dealing with the influences of the *antidiuretic hormone* (of the *posterior* pituitary). But one of the latest reports on the antidiuretic hormone has *added* something to be explained: it was found that the secretion of the antidiuretic hormone was—paradoxically—*stimulated* rather than *diminished* after a high electrolyte concentration had been produced by the mineralocorticoid, desoxycorticosterone acetate.

Studies on ACTH have indicated that this hormone may be useful in increasing and maintaining the circulating volume after plasma or blood has been lost. It causes the retention of sodium (and therefore *water*). In clinical application, however, this effect does not take place until 24 to 72 hours after administration is begun. Consequently it is essential that established measures, such as infusion of plasma or transfusion of whole blood, be employed immediately after severe decrease in the blood volume.

## Disadvantages of Delay

The *dangers* of delay in restoring blood fluid after conspicuous losses—when vascular collapse is imminent—need no further emphasis. Not so generally recognized is the fact that *delay*—in more common but less critical situations—actually




*. . . and delay in replenishing the blood fluid makes it difficult to restore the original circulatory volume.*

makes it difficult to restore the circulatory volume to the original level. *Price*[1] emphasizes the importance of this fact in the report cited previously. It would seem that failure to replace fluids promptly makes it difficult to do so at all because the patient's "adaptive" or "compensatory" processes have adjusted his physiologic functions to operate in accord with the new blood volume. Once these adjustments have taken place, attempts to increase the blood volume suddenly are "resisted" in an effort to maintain the equilibrium at the new status. These principles have important practical applications. They indicate the need for replacing blood and plasma, volume for volume, as the losses occur. "Many conditions, surgical and medical, are characterized by reduced blood volume. Restoration of blood volume to normal is an important part of the rational, successful treatment of those conditions, Good preoperative and postoperative care includes control of blood volume."[1]

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1. Price, P.B.: Blood Volume in Health and Disease, J.A.M.A. *145*:781 (March 17) 1951.
2. Noble, R.P., and Gregersen, M.I.: Blood Volume in Clinical Shock, J. Clin. Investigation *25*:158 (March) 1946.
3. Gibson, J.G., and Evans, W.A.: Clinical Studies of the Blood Volume, J. Clin. Investigation *16*:317 (May) 1937.

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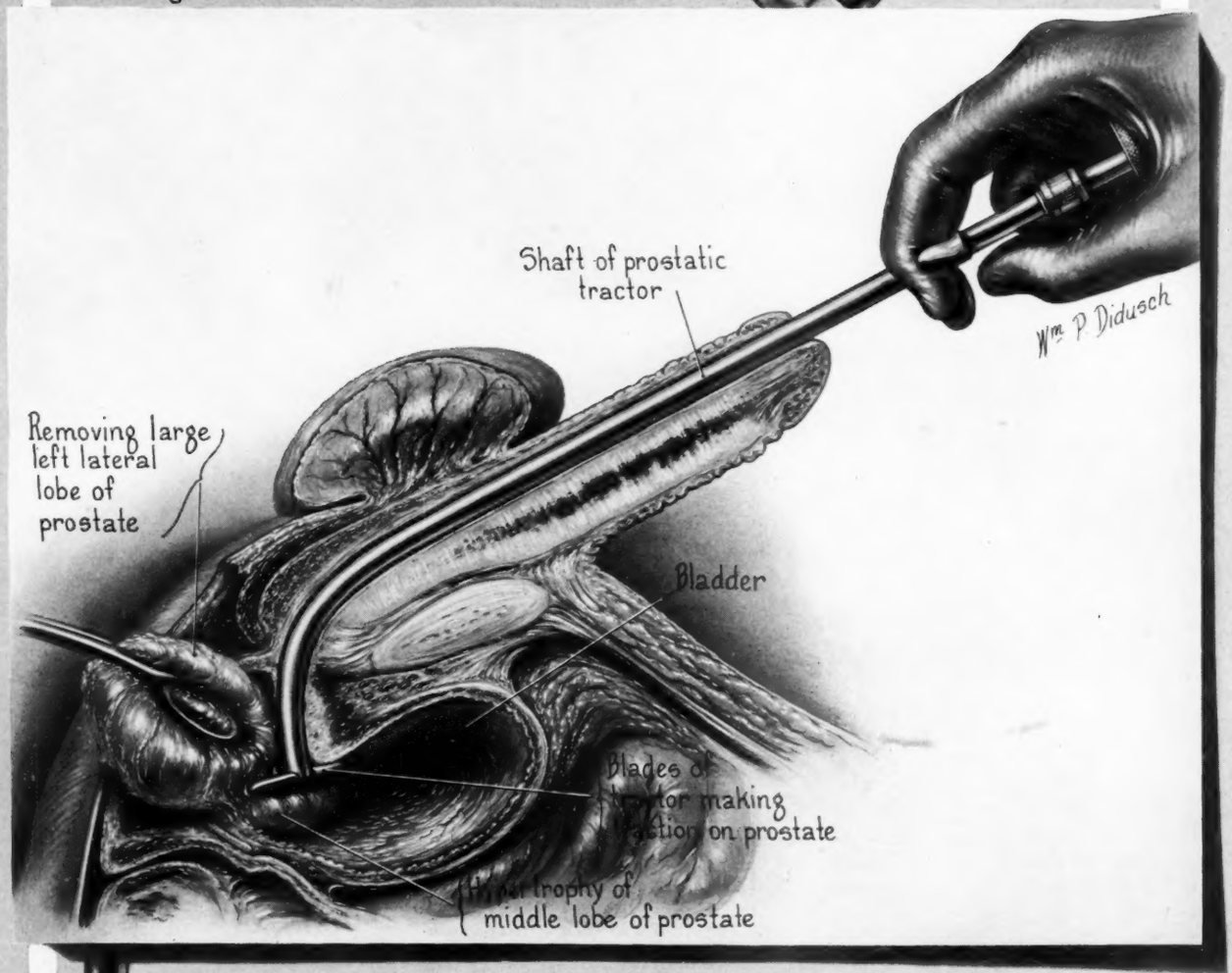
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1. Bowers, W. F.: Chlorophyll in Wound Healing and Suppurative Disease, Am. J. Surg. 73:37, 1947.
2. Niemiro, B. J.: Delayed Healing in Pilonidal Cyst Wounds, Journal Lancet, Sept. 1951.

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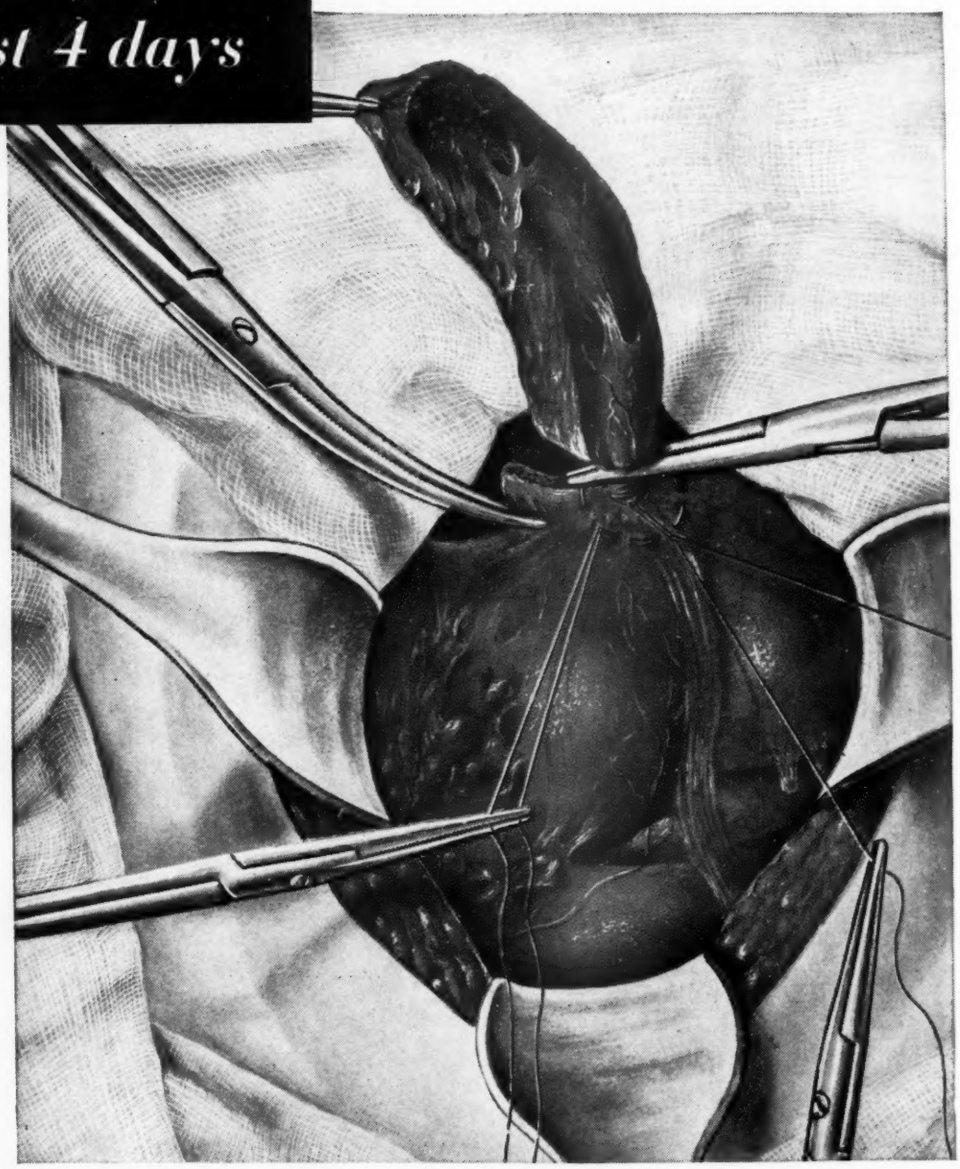

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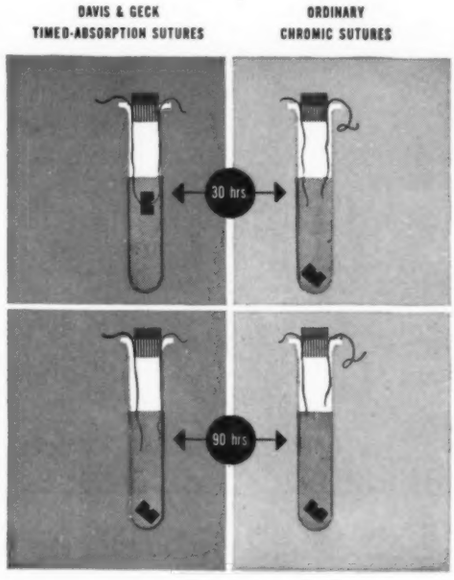


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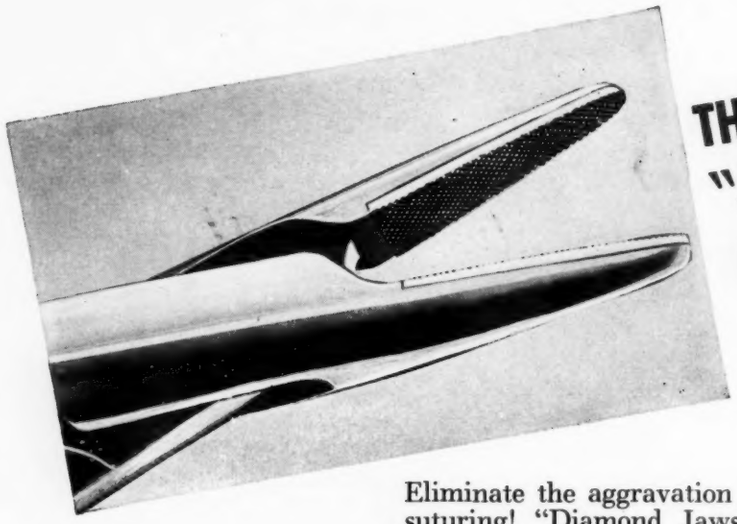

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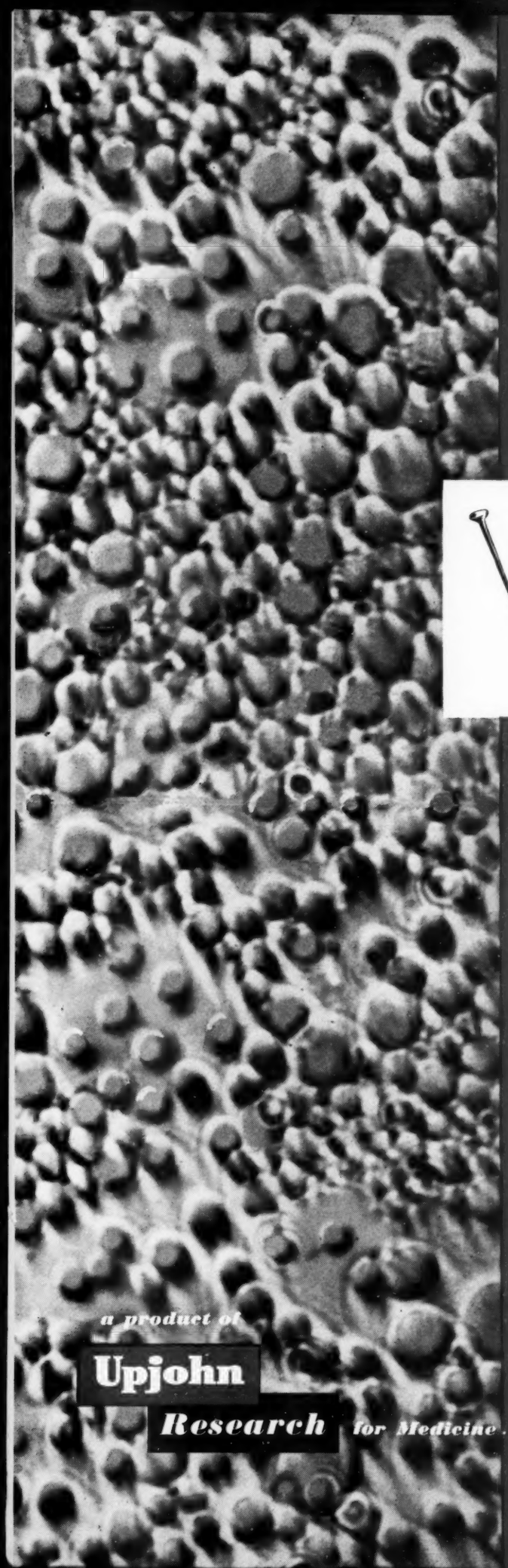

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# Outside the Ivory Tower

"Frontal Lobotomy and Affective Behavior —A Neurophysiological Analysis" by John F. Fulton, M.D., Sterling Professor of Physiology, Yale University, has the imprint of being a gem in its field. This, because Dr. Fulton, the author, experimental physiologist, scholar and historian, is known throughout the world as the leading authority in his field. To one and all interested in the most recent developments in surgical methods for the relief of mental disease this book is most highly recommended. It is a small volume with 159 pages, 201 references, is illustrated and has an index. The price is $3.

THERE are 2,267 public venereal disease clinics in the United States and Territories of Alaska, Hawaii and Puerto Rico. North Carolina leads all other states with 222 venereal disease clinics. Mississippi has 176 clinics; Georgia 155, Pennsylvania 139, Florida 131, California 118, Kentucky 106, Texas 101, South Carolina 97 and Louisiana 93. All other states have fewer than ninety clinics.

THE doctors of Harlem Hospital, which is under the direction of Dr. Louis T. Wright (New York), used oral terramycin in treating 177 cases of gonorrhea, twenty of lymphogranuloma venereum and eleven of granuloma inguinale. A primary cure rate of 92.6 per cent is reported in the terramycin treatment of male patients with gonorrhea. Smears and cultures were negative in the majority of cases twenty-four hours after therapy began. There were only thirteen relapses. Both 1 and 2 gm. dosage schedules were tested. Results showed the smaller dose as effective as the larger. All the cases were adequately followed up in both clinic and laboratory and no side reactions serious enough to necessitate discontinuing the treatment were noted. The clinicians concluded that terramycin is admirably suited to treatment of this infection.

SUPPLEMENTING the work of the government's Department of Public Health and of the Rockefeller Foundation, which has been functioning there for five years, a new, modern clinic and laboratory on tropical diseases will be opened this Fall in the Dominican Republic, according to announcement by the Dominican Republic Information Center, 507 Fifth Avenue, New York, N. Y. The new clinic will operate as a branch of the Institute of Tropical Medicine of the Bowman Gray School of Medicine of Wake Forest College, Winston-Salem, North Carolina, under direction of Dr. Thomas T. Mackie, head of the Institute, and one of the foremost experts on tropical diseases in the country. Dr. Mackie has been working for a year on frequent visits to the Republic to establish the clinic and will return in August to complete preparations.

The clinic will be located on the plantation of the Boca Chica Sugar Company on the edge of the Caribbean 25 miles east of Ciudad Trujillo, the capital of the country. One-half of the estimated expenses of the operation, from $50,000.00 to $75,000.00 a year, will be borne by Boca Chica's parent company, the West Indies Sugar Corporation, an American concern which also owns four other plantations in Santo Domingo and has an annual production of about 200,000 tons. The other half will be borne by the following pharmaceutical companies: Eli Lilly & Co., Parke-Davis & Co., Hoffmann LaRoche, Inc. and G. D. Searle & Co. The Dominican Health Department will give extensive cooperation and will benefit by receiving results of experimentation and research amongst 50,000 sugar plantation employees.

TO improve instruction in cancer diagnosis and treatment by future physicians, dentists and osteopaths, Public Health Service Grants of $885,067 have been made by the Cancer Institute of the National Institutes of Health, Federal Security Administrator Oscar R. Ewing announced. Thirty-seven medical schools and sixteen dental schools are the recipients of these grants which were approved by Surgeon General Leonard A. Scheele of the Public Health Service following recommendations made by the National Advisory Cancer Council. Except for a new grant to establish a cancer training program at the University of Puerto Rico Medical School, all fifty-three grants were made to continue, expand or improve existing programs.

WITHIN the few years from 1939–1948 there have been appreciable increases in the chances of eventual death from the

*(continued on page 24)*

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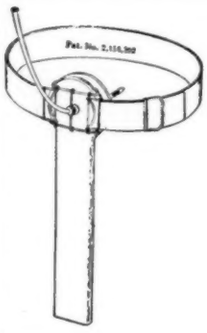

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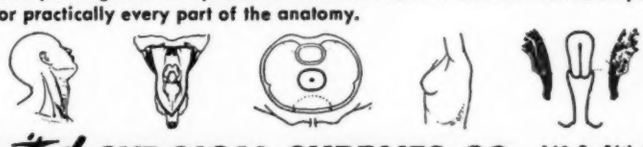

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# Outside the Ivory Tower

(continued from page 22)

cardiovascular-renal diseases or from cancer. On the other hand, the chances of dying from pneumonia and influenza or from tuberculosis have decreased rapidly; for fatal accidents there was little change.

PRIVACY with light is achieved in this new interior glass door made with the Blue Ridge Muralex pattern on both sides, 3/8 inch thick heat-tempered for strength, and supported on sturdy ball-bearing hinges. A modern touch to any office, it is being introduced by Libbey-Owens-Ford Glass Co., distributors and dealers.

A WARNING against unplanned acceleration in medical educational facilities for the training of physicians was voiced by Dr. Willard C. Rappleye, dean of Columbia University's Faculty of Medicine, in his annual report to the president of the University. "The pressure for increased enrollment and acceleration of medical training," Dr. Rappleye declared, "carries a great threat to the quality of medical education that has been built up in this country during the last forty years." He cited the enormous pressure from public sources, colleges, political agencies, newspapers and others, combined with the increased income that medical schools would obtain, as factors working toward hasty expansion of medical schools. The pressure for expansion arose, according to Dr. Rappleye, from the general prediction that the United States would face a serious shortage of physicians by 1960. While in agreement with the belief that shortages do exist in some rural communities and in some medical specialties, Dr. Rappleye saw the solution to the problem in rectifying the unequal distribution of doctors.

"As facilities and inducements are developed in smaller and rural communities and in certain undermanned specialty fields," he explained, "there will be a redistribution of professional manpower into those areas.

"Inducing doctors to move from congested areas where there is already an oversupply of physicians would be the quickest and most satisfactory way to meet many of the needs of the regions short of physicians. Merely producing a surplus of doctors who will congregate in the cities cannot possibly solve the problem of medical care in the smaller and rural communities."

THE book, "Surgical Care—A Practical and Physiologic Guide," is an up-to-the-minute, different, authoritative work deserving of a large and wide distribution. It is written by Robert Elman, M.D., who is Professor of Clinical Surgery at Washington University School of Medicine. It is published by Appleton-Century-Crofts, Inc., of New York. To give one an idea what is between the book's covers we give an outline of the contents: Preface, Introduction, Systemic Reaction to Trauma, Psychogenic Factors in Surgery, Nutrition in Surgery, Physical Factors in Surgery, Basic Preoperative Care, Anesthesia, Inhalation Therapy and Resuscitation, Routine Postoperative Care, Chemotherapy in Surgery, Postoperative Pain, Pulmonary Complications, Thromboembolic Disease, Postoperative Renal Dysfunction, Surgical Shock, Wound Complications, Abdominal Complications, Postoperative Fever and Thermal Burns. There is an author and a subject index; at chapter endings is a bibliography. This book contains 586 pages and is illustrated.

THE National Foundation for Infantile Paralysis announces the availability of a limited number of additional postdoctoral fellowships to candidates whose interests are research and teaching in medicine and the related biological and physical sciences. The purpose of these National Foundation fellowships is to increase the number of professional workers qualified to give leadership in the solution of basic and clinical research problems of poliomyelitis and other crippling diseases. The fellowships cover a period of from one to

(continued on page 26)

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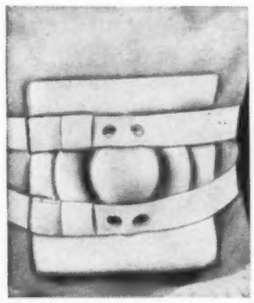

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* Ref. Am. J. Surg., March, 1951.
J.A.M.A. April 21, 1951 p. 1238

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# Outside the Ivory Tower

(*continued from page 24*)

five years. Stipends to Fellows range from $3,600 to $7,000 a year, with marital and dependency status considered in determining individual awards. Institutions which accept Fellows receive additional compensation for expenses incurred in relation to their training programs. Eligibility requirements include United States citizenship (or the declared intention of becoming a citizen), sound health and an M.D., PH.D., or an equivalent degree. Selection of candidates is made by a Fellowship Committee composed of leaders in the fields of research and professional education. The designation "Fellow of The National Foundation for Infantile Paralysis" will be given to successful candidates. A total of 104 fellowship awards in these categories have been made by the National Foundation up to August 31, 1951. Complete information concerning qualifications and applications may be obtained from: Division of Professional Education, The National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

DESPITE good environmental sanitation programs in large cities, amebiasis, a parasitic infection often transmitted by food handlers including workers and housewives, may be spreading, a health authority here warned. Dr. Howard B. Shookhoff, of the Bureaus of Laboratories and Preventable Diseases of the New York City Health Department, said authorities are becoming more and more aware of the great prevalance of this disease throughout the country. It has been estimated that 15,000,000 are infected. The doctor reported in the Bulletin of the New York Academy of Medicine. Amebiasis ranks second today only to malaria among the world's most widespread protozoan infections, he pointed out. "Although malaria is slowly being squeezed out of existence by new programs," he declared, "amebiasis on the other hand may actually be spreading."

A NEW method to facilitate the detection of heart murmurs, employing the vasoconstrictor neo-synephrine, is reported by Dr. E. M. M. Besterman, a specialist in rheumatic fever, in the August issue of the *British Medical Journal*. The method promises speedier diagnosis of damage to heart valves resulting from rheumatic fever. According to Dr. Besterman, injection of neo-synephrine simultaneously slows the heart rate and increases the flow of blood and stroke volume, thus accentuating the murmur, which is an abnormal, gentle swishing sound caused by a damaged valve unable to carry its load. The preparation is produced by Winthrop-Stearns Inc., of New York. Early recognition of heart valve damage is extremely important. Murmurs are often the only evidence of such damage; but in the early stage of damage, they are inaudible or faint and apt to go undetected. Dr. Besterman used the new method on sixty-four patients, thirty-five of whom were known to have rheumatic carditis and nineteen of whom had rheumatic fever with no known symptoms of heart damage. Almost all of the patients were children.

Murmurs were successfully magnified in a vast majority of cases of heart damage, and nine patients in whom no murmurs had been detected previously were found to have murmurs. In every one of the twenty-nine patients without heart damage the heart sounds were intensified but no murmurs were detected. In all cases, Dr. Besterman added, any difficulty in distinguishing between normal heart sounds and murmurs was resolved. In a group of fifteen patients murmurs had been heard but had disappeared two weeks before the tests with neo-synephrine. Murmurs reappeared in most cases in the tests. Dr. Besterman pointed out that it is important to give the neo-synephrine injections within four to five weeks in such cases of disappearing murmurs in order to bring them out again for accurate diagnosis of damage to heart valves. Neo-synephrine produced rapid results. Murmurs made audible by use of the preparation usually appeared within three minutes after injection and persisted for fifteen to twenty-five minutes. Thirty patients were given two or more injections, the others just one.

FOUR heart research projects at the University of Wisconsin got financial aid from the Wisconsin Heart Association, Milwaukee, when University of Wisconsin regents accepted association grants totaling $9,830. Two of the grants go to the department of medicine and two to the department of pharmacology. In the department of medicine $4,000 will be used for research on the effect of various drugs upon the cerebral blood flow and metabolism in

(*continued on page 28*)

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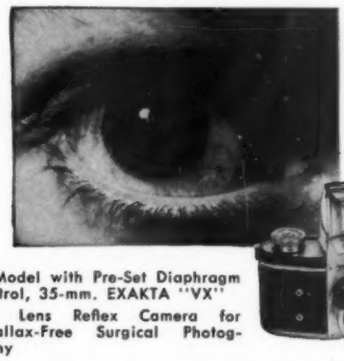

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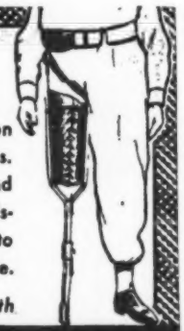

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# Outside the Ivory Tower

(*continued from page 26*)

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FORTY years ago the newly born infant of the American wage earner could look forward on the average to nearly forty-seven years of life. Today that many years still lie ahead for those who already have reached their twenty-fifth birthday. This example of the extent to which life has lengthened among the wage earning population of the country in little more than one generation is reported by Dr. Louis I. Dublin, chief statistician of the Metropolitan Life Insurance Company, and is based upon the company's experience with its millions of industrial policyholders. In 1950 the expectation of life at birth among these insured reached an all-time high of 68.3 years. This is an increase of fully one-half year over the figure for 1949 and of five and a third years since 1940.

"The remarkable gains in longevity are the direct result of important victories in life conservation through the advances in medical science and public health administration, and through the rising standard of living, which has particularly favored the industrial population," declared Dr. Dublin.

INCREASED protection for wounded soldiers exposed to frigid temperatures has been developed by the Army Quartermaster Corps in collaboration with the Medical Corps in the form of a new casualty bag, the Department of the Army announced. The bag resembles an oversized sleeping bag. An exterior layer of cotton-nylon oxford cloth, insulated with down, forms the principal material. Protection from freezing is afforded to 50 degrees below zero. Quartermaster Corps experts began development of the new bag following wide use of ordinary sleeping bags to protect wounded in World War II. The special design of the casualty bag, which has a full-around zipper, makes it simple to place the wounded man inside. Special zippers opening anywhere around the outside permit treatment of wounds without exposing other parts of the body. The bag is roomy enough to accommodate a soldier wearing bulky Arctic clothing plus a splint. Designed to be windproof and water repellent, the top layer is insulated by pure down while the layer under the body is insulated by a down-feather mixture. The under layer is additionally insulated with a compression-resistant pile fabric. Fur trimming around the face opening protects against frost or ice formed from the breath.

THE hazards of pregnancy and childbirth for the more than 3,500,000 American women who enter motherhood each year have been reduced to a level which would have seemed Utopian as recently as sixteen years ago, according to Metropolitan Life Insurance Company statisticians. This is reflected in the decline of the maternal mortality rate in the United States from 58 per 10,000 live births in 1935—the lowest ever recorded up to that time—to a rate appreciably under 10 per 10,000 nationally, and less than five per 10,000 live births in many communities throughout the country. Progress in safeguarding maternity, the statisticians point out, has come hand in hand with the increase in the proportion of women utilizing hospital facilities and the services of a physician in childbirth. In 1935 only 37 per cent of the births in the country were delivered in a hospital; by 1949 the figure had risen to 87 per cent. At the same time the proportion of women attended by a midwife dropped from nearly 13 per cent to 5 per cent.

"Advances in medical science, the developments in public health administration and the rise in our general standard of living have contributed to making motherhood safer," the statisticians comment. "This progress has saved the lives of many thousands of mothers and their infants."

About three-fifths of the births in the United States are to women in their twenties, a period of life at which the hazards of maternity are at a minimum, it is noted. Of the married women at ages twenty to twenty-four, each year one of every four has a baby. The proportion decreases rapidly with advance in age; it is one in eight at ages thirty to thirty-four, and only one in fifty at ages forty to forty-four.

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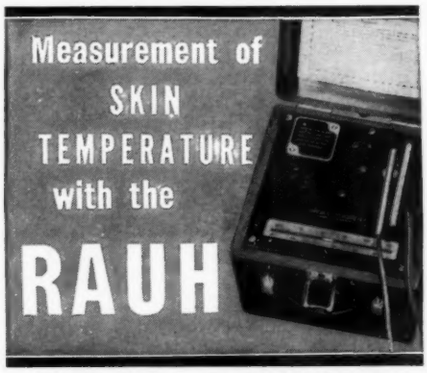


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by

**PHILIP R. ROEN, M.D., F.A.C.S.**

Instructor in Urology, New York Postgraduate Medical School; Clinical Instructor in Urology, New York Medical College; Associate Visiting Urologist, Morissania City Hospital; Assistant Attending Urologist at Midtown Hospital and Yonkers General Hospital; Civilian Consultant in Urology, U. S. Air Force, Mitchel Field Air Base Station Hospital; Diplomate, American Board of Urology.

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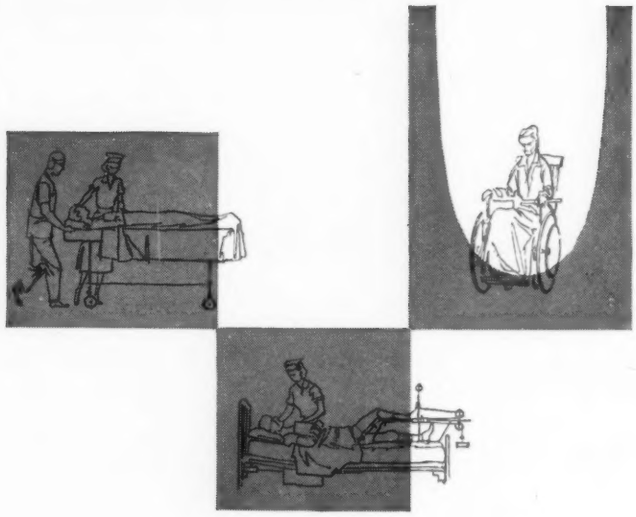

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Sixtieth Year of Publication

VOL. LXXXII NOVEMBER, 1951 NUMBER FIVE

# Original Articles

## LIPOMATOUS HYPERTROPHY OF THE ILEOCECAL VALVE*

MONTE EDWARDS, M.R.C.S. (Eng.) AND HENRY ZANGARA, M.D.

*Baltimore, Maryland*

THE numerous references in the literature to lipoma of the small and large intestine bear witness to the relatively high incidence of what may have been considered at one time a rather rare tumor. In fact routine studies such as are performed nowadays have shown lipoma to be of such frequency that its diagnosis need no longer overly excite the interest of any but the inexperienced.

Fatty tumor of the colon may be suspected by either endoscopic or roentgenologic means but positively diagnosed only on actual inspection of the removed specimen. Characteristically an encapsulated tumor growing into the lumen and attached to the bowel wall by a pedicle of varying size it will present on cross section an ovoid shape and a well defined capsule. The clinical manifestations are usually the same as for any other tumor lying within the lumen of the intestine, causing either obstructive symptoms or those related to greater efforts of propulsion.

Unencapsulated accumulations of fat involving the ileocecal valve in sufficient quantity to produce symptoms and roentgenologic changes have been described by Golden,[1] Mallory, Castelman and Parris,[2] and Kelby.[3] Noteworthy are the anatomicoroentgenologic studies of Fleischner and Bernstein[4] in pointing out certain normal variations in the appearance of the ileocecal valve which may be interpreted as pathologic processes. Whether or not lipomatous hypertrophy of the ileocecal valve deserves to be looked upon as a pathologic change needing surgical correction is likely to be the subject of some difference of opinion, but the train of circumstances which may lead to surgical interference are, to say the least, most compelling. The presenting symptoms are such as would lead one to suppose that a neoplasm may be the cause. Sufficient interference in bowel function with pain of a crampy nature may arouse the suspicions of the examiner. The lack of unusual discharges in the stool or of a palpable tumor, in spite of a perhaps lengthy history, will distract him. However, the x-ray consultant will, in all probability, provide the examiner with further food for cogitation and the report will be of some vague shadow in the cecum representing a tumor of uncertain character.

Two cases of this type have been encountered during the past year, within a month of each other. In both, the disabilities were minor,

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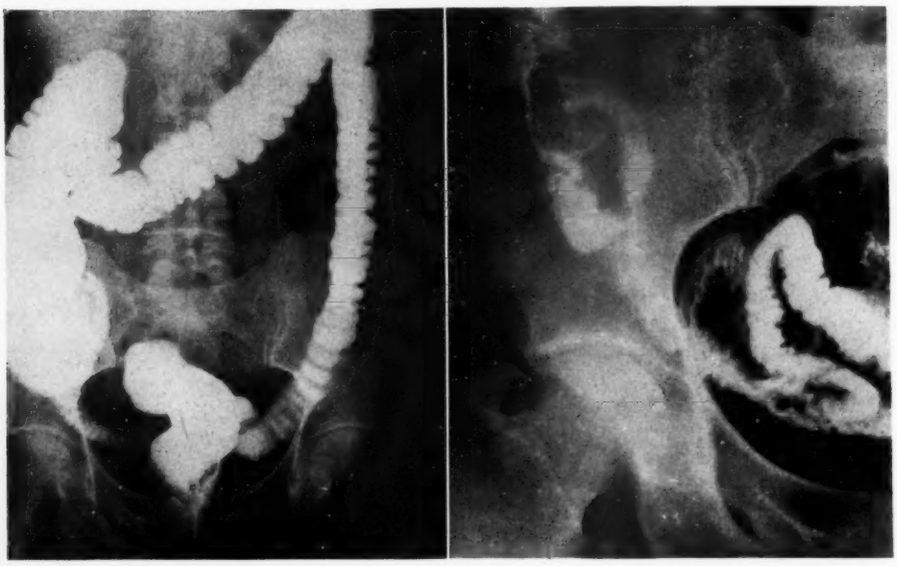

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FIG. 1. Case 1, barium enema; entire colon in the filled state; notched effect at ileocecal valve.
FIG. 2. Case 1, postevacuation roentgenogram showing hypertrophied ileocecal valve prolapsed into lumen of cecum.

x-ray findings uncertain and approach somewhat speculative, but operation was justified on the basis of suspicion of malignant disease.

### CASE REPORTS

CASE 1. C. C., a white woman age fifty-seven, was first seen on April 29, 1950, and gave a history of two episodes of difficulty in getting the bowels to move, three months and six days, respectively, prior to consultation. A small amount of fresh rectal bleeding had been noticed on the second occasion. Abdominal discomfort although present had not been a prominent feature. There had been no weight loss. Past history included hysterectomy and bilateral salpingo-oophorectomy performed sixteen years previously. Physical examination disclosed very little information. There was a low, midline, abdominal scar but no abdominal mass, tenderness or distention. Anoscopy showed some mild hemorrhoidal redundance. Proctoscopy was limited to 17 cm. by virtue of some fixation, probably the consequence of a previous pelvic laparotomy. Roentgen examination had been performed on May 5, 1950, and the following are the roentgenologist's observations and deductions:

Examination of the colon by means of a barium enema showed the colon to fill readily. The only definite abnormality demonstrated was a rather deep indentation on the medial wall of the cecum at the junction of the ileocecal valve at the site of the lowermost circular contraction. (Fig. 1.) After evacuation the colon was well emptied. There was excellent visualization of the mucosal pattern. At this time a filling defect measuring about 4 cm. in length and approximately 2 cm. in width was noted. (Fig. 2.) The lesion described in the cecum was certainly not a very striking one with the colon in the filled state. However, in the evacuation state the defect appeared well defined, sufficiently so to indicate that a lesion existed, conspicuous enough to justify exploration. It probably represented a new growth.

The patient was admitted to the Hospital for the Women of Maryland on May 21, 1950. Laboratory findings were of no particular significance. Prior to operation on May 24, 1950, she was given an adequate course of chloromycetin. Under intravenous sodium pentothal anesthesia supplemented by cyclopropane inhalation a long, right, mid-rectus incision was made and the rectus muscle split longitudinally. The abdomen was opened. Exploration of the abdominal viscera revealed nothing abnormal except for the cecum, palpation of which revealed a rather soft, elusive mass in the neighborhood of the ileocecal valve. The terminal ileum, cecum, ascending colon and

hepatic flexure were mobilized with some difficulty because of numerous adhesions. To determine the character of the lesion the bowel was opened over it and direct inspection was made. The valve itself was found to be the site of a peculiar fatty infiltration which enlarged it to the size of a small cruller, prolapsing into and almost occluding the lumen of the bowel. The cecotomy opening was closed. Resection of the involved area was effected, continuity being re-established by end-to-end anastomosis. It was noted that the mesentery and mesocolon in the vicinity of the lesion were heavily infiltrated with soft, friable fat which made repair of the defect somewhat difficult. The omentum was used to reinforce all suture lines and fill the gap in the right colic gutter. The abdomen was closed in the usual manner and the patient returned to her room in good condition. Postoperative convalescence was uneventful and the patient was discharged from the hospital on June 7, 1950. No untoward symptoms have developed since operation.

Pathologic report (No. B8397) revealed that the specimen consisted of a cecum and terminal ileum. The cecum had been incised and closed with catgut sutures. On opening the bowel the mucosa of both the cecum and the ileum appeared normal. However, there was an extensive fatty infiltration of the mucosa about the ileocecal valve which gave it a very edematous appearance. The mucosa itself was very congested. There was no obstruction of the lumen but the mucosal epithelium at the valve was eroded, exposing the infiltrating lipoid tissue. (Fig. 3.) Microscopically, sections through the ileocecal valve were characterized by a marked fatty infiltration of the submucosa. The mucosal epithelium was partly eroded and infiltrated with numerous eosinophils and plasma cells. The adipose tissue, also, contained areas of the same type of infiltration. The lymph follicles were comparatively small. The sections of ileum were characterized by hypertrophy of the lymphoid tissue and fatty infiltration of the submucosa. The adipose tissue in the cecum was much thicker than in the ileum.

Pathologic diagnosis was marked fatty infiltration of the submucosa of the ileocecal valve and adjacent ileum and cecum.

FIG. 3. Case I, gross operative specimen; longitudinal section through terminal ileum, cecum and ascending colon; marked enlargement of ileocecal valve from fatty infiltration.

CASE II. H. A. M., a white woman age fifty-five, was admitted to the University Hospital on June 2, 1950, with a history of repeated attacks of diarrhea and severe abdominal cramps since March, 1950, with no vomiting, nausea or distention. Concurrently there were syncopal attacks of a rather uncertain character attributable, perhaps, to some myocardial insufficiency but having features suggestive of migraine. There was no record of weight loss. The patient was treated initially for mucous colitis and at one time responded to sulfasuxidine therapy. Past history included a laparotomy performed ten years previously at which time the appendix, right tube, right ovary and gallbladder were removed. General physical examination gave no very relevant information. The abdomen although obese was of otherwise normal contour and conformation, without mass, tenderness or distention.

The x-ray report of the barium enema done on June 3, 1950, was, in part, as follows: On reaching the junction of the ascending colon with the cecum there was a rounded, well defined filling defect intruding into the lumen of the colon. (Figs. 4 and 5.) The mass measured 4 cm. in its greatest diameter and had a slightly irregular periphery. In spite of using as much pressure as the patient could tolerate none of the barium could be forced into the terminal ileum. The lesion on the right was believed to be a neoplasm, either an adenocarcinoma or a carcinoid.

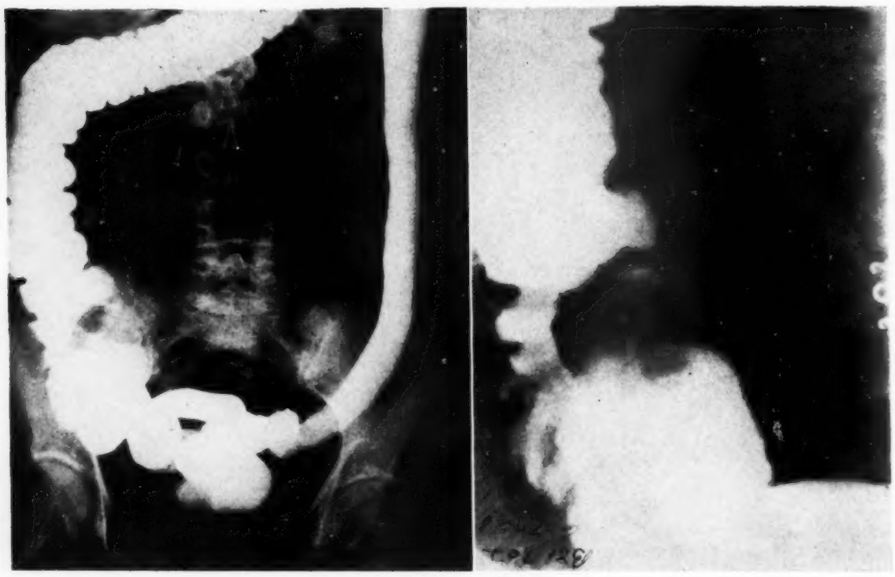

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FIG. 4. Case 11, barium enema; filled colon, filling defect at ileocecal valve.
FIG. 5. Case 11, barium enema; spot film of cecum and ascending colon.

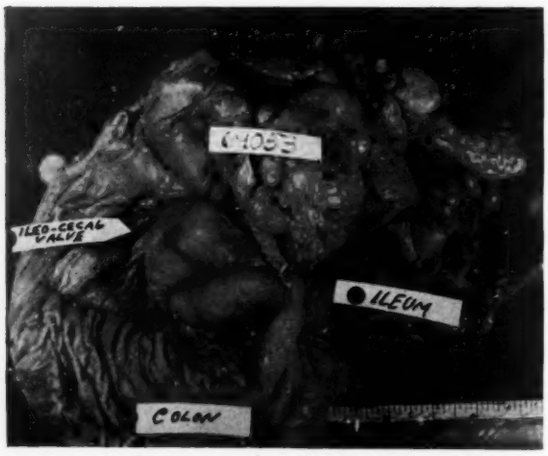


FIG. 6. Case 11, gross specimen; cruller-like appearance of ileocecal valve.

Following sulfathalidine preparation operation was performed on June 12, 1950, under intravenous sodium pentothal and spinal anesthesia. Through a low, right, paramedian incision the abdomen was opened. The terminal ileum, cecum and ascending colon were delivered with the release of many old postoperative adhesions and division of the parietal attachments of the right colon. A soft tumor was palpated in the ileocecal region and there were no palpable lymph nodes in the adjacent mesentery. The ascending colon, cecum and 29 cm. of the ileum were removed. Aseptic side-to-side anastomosis was performed, the defect in the mesentery closed and the laparotomy wound repaired. Postoperatively a phlebothrombosis of the right foot developed yielding to anticoagulant therapy. Other than this the hospital course was uneventful. The patient was discharged on July 3, 1950, and has remained symptom-free.

Pathologic report (No. S.P. 69053) revealed that the specimen consisted of a cecum and 29 cm. of terminal ileum. The appendix was surgically absent, and the terminal ileum was adherent to the side of the cecum causing a rather acute angulation. The serosal aspect of the ileum and cecum was otherwise normal. When the terminal ileum and cecum were opened, the mucosal aspect of the ileum was normal in appearance. The mucosa immediately proximal to the ileocecal valve showed flattening of the rugae. However, it did not appear indurated and no evidence of ulceration or thickening was noted. The ileocecal valve appeared edematous and the mucosa in this area protruded into the cecum. It had much the same appearance as a boggy cervix protruding into the vagina. A tiny adenoma 0.5 cm. in diameter was present immediately distal to the ileocecal valve posterior to the cecum. (Fig. 6.) Microscopically, sections of the ileocecal valve showed a mucosal layer composed of tall, actively secretory columnar epithelial glands with distinct basement membranes. The stromal tissue surrounding the glands was loose and edematous in appearance and showed generalized lymphocytic infiltration and a localized

area of interstitial hemorrhage. Beneath the tunica propria a rare, smooth, muscle fiber was seen. The remainder of the underlying tissue and by far the bulk of the specimen consisted of adipose tissue. A section from the cecum showed normal mucosal cells and glands. The tunica propria and submucosa showed diffuse lymphocytic infiltration and large lymphoid follicles. The muscularis was of normal appearance. What was thought grossly to be a tiny adenoma appeared to be a localized area of lymphoid hyperplasia. Pathologic diagnosis was lipomatous hypertrophy of the ileocecal valve.

## COMMENT

Interest in this type of lesion arises not so much from its rarity as from the diagnostic criteria which may lead to its more frequent recognition. Its location at an anatomic narrowing of the bowel and its peculiar behavior on barium enema study along with uncertainties attendant on surgical interference give it some resemblance to prolapse of the gastric mucosa through the pylorus.

The deformity seen by the roentgenologist, although apparent in both cases during the process of filling, was in one case more conspicuous on the evacuation film; the effect was suggestive of the mushrooming seen in its pyloric counterpart. Furthermore, distinction preoperatively between this lesion and a pedunculated tumor or even carcinoma cannot be determined with any certainty.

Some doubt as to the necessity for and the extent of removal may overtake the surgeon after exposure of the lesion, but justification for fairly radical resection is forthcoming in anticipation of some such complicating factor as intussusception or obstruction.

Pathologically, discrimination between true lipoma and this type of lipomatosis may be made on the basis of presence or absence of a well defined capsule. Strombeck[5] finds some relationship between hypertrophy of the ileocecal valve and terminal ileitis, but it can be said with certainty that in the cases here presented there was no evidence of any significant old or recent inflammatory process. One common factor to both reported cases lay in the performance of a previous abdominal operation.

These cases are presented for two purposes, namely, to direct attention to a type of lesion—lipomatous hypertrophy of the ileocecal valve—distinct from the usual variety of lipoma and presenting some rather peculiar roentgenologic findings and to apprise the surgeon of the necessity for a major operation should he believe there is premise for removal of the lesion.

*Acknowledgment:* The authors desire to express their appreciation to Dr. Charles Reid Edwards, Professor of Surgery, University of Maryland, for his permission to publish Case II.

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## DISCUSSION

Daugh W. Smith (Nashville, Tenn.): Lipomatous disease of the gastrointestinal tract is no longer a pathologic curiosity. In fact submucosal lipoma is second in frequency of benign tumors of the colon, the cecum being the most common site in the large bowel. However, lipomas occur slightly more frequently in the small intestine than in the colon. Lipomatous tumor formation seems to have special predilection for the ileum and cecum.

In a discussion of this character, faulty fat metabolism, one must think of the encapsulated tumor growing into the lumen and attached to the bowel wall by a pedicle of varying size. Also to be considered is Whipple's disease which is characterized by deposits of unencapsulated fat where the mucosa of the jejenum and ileum is largely replaced by lipoid tissue. The type of faulty fat metabolism which is illustrated by the cases presented herein, too, should be taken into consideration. Excessive deposits of fat are frequently seen in the capsule of the liver, pancreas and heart muscle of obese individuals. One must consider whether we are dealing with a separate pathologic entity or a hypertrophied ileocecal valve with more than the usual amount of submucosal fat. Routine autopsy specimens will reveal hypertrophied ileocecal valves from patients who had no symptoms of chronic intussusception. These specimens are fatty and uniformly enlarged.

# A RARE ANOMALY OF THE RECTUM AND LOWER URINARY TRACT*

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THE incidence of congenital abnormalities of the anus and rectum is said to be about one in every 5,000 to 10,000 newly born babies. The largest series of such cases is that reported by Ladd and Gross.[4] In their series of 214 cases seen at the Boston Children's Hospital from 1908 to 1939 sixty cases or 28 per cent of the total number had other congenital anomalies in addition to those affecting the anus or rectum. Of these associated anomalies one case had a double penis, five cases had hypospadias, three cases had undescended testes and two cases had bifid scrotum.

In a group of ninety-eight cases with malformations of the anus and rectum reported by Bacon and Hering[1] twenty-nine cases or approximately 30 per cent had associated congenital anomalies. In Berman's[2] series of twenty-three cases of congenital anomalies of the anus and rectum 56.5 per cent had associated anomalies. In Vasilas'[7] series of seventeen cases of congenital anomalies of the anus and rectum nine cases had associated anomalies.

Among the more uncommon anomalies associated with malformations of the anus and rectum are those of double urethra and diphallus, or double penis. In 1946 Moore[5] described a case of reduplication of the urethra and said that only thirty-eight cases of double urethra had appeared in the literature up to 1932. In 1942 Cochrane and Saunders[3] described a case of a newborn with a double glans penis and an imperforate anus.

In 1950 Pendino[6] reported a case of double penis, bringing the total number of such cases reported in the literature to fifty-three. He remarked that such an anomaly, i.e. double penis, is usually associated with other anomalies, the most common one being an imperforate anus.

The case to be presented is unique in that congenital malformations of the anus and rectum are associated with other interesting anomalies.

## CASE REPORT

S. J., an 8½ pound male child, entered St. Mary's Hospital, St. Louis, Missouri, on November 17, 1949, when twelve hours old. He had been delivered in Illinois approximately 150 miles from St. Louis. The baby was full term and the mother's labor was three hours long. She had had four previous pregnancies with living normal babies.

Upon entry to the hospital the following congenital abnormalities (Figs. 1 and 2) were found: double penis, cleft scrotum, bilateral hypospadias (penoscrotal junction), absence of the anus, atresia of the rectum, a defect in the lower anterior abdominal wall, protrusion of an unidentifiable structure through the perineum and absence of the pubic arch (x-ray).

The defect in the ventral abdominal wall was approximately 6 cm. in diameter and was situated in the midline where one would expect to find the symphysis pubis. The umbilical cord stump surmounted the center of this defect, and the thin translucent membrane that covered the umbilical cord also covered the abdominal wall defect.

A separate penis and scrotum were situated on each side of the body at the junction of the groin and upper thigh, and a bilateral hypospadias was present, the urethral openings being placed at the medial aspect of the penoscrotal junction. Urine was seen to flow from the urethral opening on each side. A testis was felt in the scrotal sac on the left side, but none could be found on the right side.

The report of the x-ray examination of the entire body made shortly after admission in the anteroposterior view was as follows: There was a defect of the innominate bone with only slight rudimentary pubic bones bilaterally and wide

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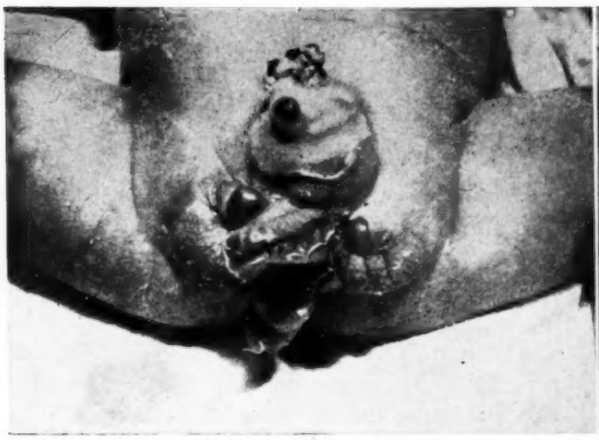

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FIGS. 1 and 2. Photographs of patient on admission to hospital.

space of separation at the symphysis. There were also soft tissue irregularities noted about the perineal region. The remainder of the bony skeleton failed to reveal any evidence of congenital anomaly, fracture, dislocation or other bony pathologic disorder. This type of defect was usually associated with exstrophy of the bladder. (Fig. 3.)

The lung fields appeared clear. The cardiac and aortic silhouettes were within normal limits.

A small amount of gas was noted in the stomach and small intestine.

Re-examination with the head down and the buttocks elevated and the mercury bulb of a thermometer placed at the site of the imperforate anus revealed a small amount of gas in the pelvis which may be within the rectum or sigmoid. There was a distance of about 2.5 cm. separating the gas-filled loop of bowel from the bulb of the thermometer.

Urinalysis revealed 2 plus albumin, a trace of sugar and on microscopic examination an occasional white blood cell. The red cell count was 7,230,000 with 18 gm. per cent hemoglobin; the white cell count was 18,650 with 6 young forms, 31 stab forms, 46 segmented forms, 13 lymphocytes and 4 monocytes.

The baby was taken to the operating room that same afternoon and under ether anesthesia the abdomen was opened in the midline just above the defect in the abdominal wall. The urinary bladder was situated just beneath the defect but more to the right of the midline; and the right testis was found high in the pelvis on the right side. There was an atresia and incomplete descent of the rectum, which ended in a blind pouch, and the entire rectum was found to be doubled up in a firm rounded mass approximately 5 cm. in diameter to form a nodule at the terminal end of the gut. This was placed rather deep in the pelvis. Two rather large diverticula of the urinary bladder were seen to protrude through the perineum to the outside and represented the unidentifiable

FIG. 3. Photograph of x-ray of entire body showing defect of pubic arch.

structures described previously. No other intra-abdominal abnormalities were found.

The rectum and sigmoid were dissected free by splitting the peritoneum on either side and downward into the pelvis. The lower colon and rectum were entirely freed of their pelvic attachments and brought out into the wound. The two structures protruding through the perineum were incised, found to contain a clear fluid, presumably urine, and they were also found to be directly connected with the bladder. They were excised at their junction with the bladder and perineum, and the bladder opening was closed with a double row of inverting sutures. The perineal skin was closed over this. A small linear incision was then made at the site at which the anus should be, and the distal bowel (rectum and sigmoid) replaced in the pelvis and brought out through this perineal skin incision in a "pull through" fashion. The distal nodular end of the bowel was excised, and the proximal cut end (sigmoid colon) was sutured to the edges of the perineal wound with interrupted silk sutures, forming a perineal colostomy. Meconium immediately emerged from the bowel. The abdominal wound was sutured with catgut for the peritoneum, and interrupted silk was used for the fascia and skin.

Pathologic examination of the tissue removed showed that the two structures attached to and communicating with the bladder through the perineum represented intestinal tissue and were lined by necrotic rectal mucosa. There was acute and chronic subserosal inflammation. The nodular mass excised from the terminal end of the bowel was found to be a necrotic postanal cyst 5 by 3 cm. in size.

Postoperatively, the patient vomited bile-stained material several times a day. The bowels continued to move, but the urinary output progressively diminished. It was thought that possibly another gastrointestinal abnormality was present which had been overlooked at the time of the operation. On the fifth postoperative day the vomiting still continued, despite the stoppage of feeding and gastric lavage. The non-protein nitrogen was 32, and the white blood count was 6,350 with a differential count indicating a moderate infection. The abdomen began to be somewhat distended and an x-ray revealed gas within the stomach and small intestine. The membrane covering the lower abdominal wall defect was becoming necrotic, and it was decided to re-operate on the eighth postoperative day. During the postoperative course the patient had been receiving penicillin, vitamins and intravenous glucose and saline in addition to the regularly attempted feedings of his formula. The temperature did not rise above 98.6°F. during this time.

On November 25th under ether anesthesia the abdomen was again opened through the previous incision, and the necrotic tissue covering the ventral defect was excised. No other abnormalities were found on re-examination of the abdominal contents. The urinary bladder was distended and its wall was quite thickened. Because there seemed to be some obstruction of the lower urinary tract, a cystostomy was done and a small Foley catheter was inserted. The abdominal wound was then closed and the defect in the ventral wall was repaired with through-and-through steel wire sutures. The perineal sutures were also removed at this time as healing had taken place.

After operation grunting expirations developed with retraction of the lower ribs and a diminution of breath sounds on the right side of the chest. It was thought that an atelectasis was present, and an x-ray showed an atelectasis on the right side with partial collapse of the underlying lung with a shift of the mediastinal structures to the left. There was an increase in density of the left lung, probably due to compression. The baby became pale and cyanotic despite oxygen and carbon dioxide mixture and died November 26th.

An autopsy was performed with the following findings (in addition to the abnormalities previously described): (1) acute bronchopeumonia, (2) dilatation of both ureters (more marked on the left) and (3) tension pneumothorax on the right, following rupture of an emphysematous bleb.

The pathologic report revealed the immediate cause of death was pneumonia. The histologic change was that of an acute pneumonic reaction scattered throughout both lungs. The alveoli of both lungs were stuffed with cornified epithelia and granular debris.

SUMMARY

A case is presented with congenital malformations involving the anus and rectum associated with other unusual congenital anomalies.

The literature relative to associated anom-

alies in cases of congenital malformations of the anus and rectum is briefly reviewed.


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DISCUSSION

Garnet W. Ault (Washington, D.C.): Dr. Burns has indicated that many of these patients with congenital anomalies of the rectum and anus may have associated anomalies elsewhere. This is important for we must recognize this whenever possible and make our plans accordingly. I am sure Dr. Burns and his associates spent nine anxious days between November 17th and November 26th caring for this infant whose eight congenital anomalies have been enumerated.

Because our time is limited I shall confine my remarks to a discussion of the infant's anorectal anomaly.

It is interesting to note that a film taken in the inverted position indicated that there was a gas bubble 2.5 cm. from the thermometer bulb placed on or in the anus. Ordinarily this would make the most distal portion of the hindgut or rectal pouch accessible by a perineal approach. However, in this particular instance the need for an abdominal exploration was evident and laparotomy revealed that the bowel terminated in a nodular mass deep in the pelvis. The decision to do a "pull through" procedure was indeed a wise one for the bowels continued to move with some degree of competence upon completion of the "pull through." When the second operation revealed the presence of urinary retention with hypertrophy of the bladder wall, it became evident that this probably played a role in the development of the ileus, nausea and vomiting. It is unfortunate that a fatal pneumonia terminated this infant's life.

We are particularly interested in the method of anastomosing the distal end of the sigmoid colon to the anal skin. Had this child lived he may have had a perineal colostomy with or without control. We are all familiar with the textbook demonstrations of a linear incision or circular excision of the skin of the anal perineum. Few recognize that several years later many of these children develop an ectropion or eversion of the mucosa, or even a prolapse. Because the anal canal is not lined by modified skin they develop a wet perineum not unlike the deformity seen after an improperly performed Whitehead operation. A variable degree of incontinence accompanies this type of deformity.

# NEW HORIZONS IN PROCTOLOGY

## THE THIRD JOSEPH McDOWELL MATHEWS MEMORIAL ORATION

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I SINCERELY appreciate your gracious invitation to deliver this the third oration in memory of Joseph McDowell Mathews.

In Ecclesiasticus 38: 1 we read: "Honor a physician with the honor due unto him. The skill of the physician shall lift up his head and in the sight of great men he shall be in admiration."

The biennial presentation is a well merited honor to the memory of Dr. Mathews, a man of sterling character, a skilled surgeon and an eminent leader in the medical profession. The American Medical Association recognized these qualities when it chose him president in 1898. When the Association convened in Columbus, Ohio, the following year, Mathews arranged for a group of thirteen well known proctologists to meet there. They organized the American Proctologic Society, elected Mathews of Louisville, Kentucky, president, and presented a scientific program.

Parenthetically, John A. Wyeth of Alabama was a fellow student with Mathews at Louisville. Later each had an experience with remarkable consequences. As at that time post-graduate courses in proctology and general surgery were not available in the United States, both went abroad to study. In 1877 Mathews enrolled at St. Mark's Hospital, London, then headed by the distinguished surgeon, Mr. William Allingham. Five years after he returned to Louisville a department of rectal diseases was created at the University and Mathews became its first head.

After attending several medical centers on the continent, Dr. Wyeth returned to New York and in 1881 organized the New York Polyclinic Medical School and Hospital, "The pioneer post-graduate Medical Institution in America." It is noteworthy that later both Mathews and Wyeth were elected to the presidency of the American Medical Association, being two of twelve graduates of the University of Louisville so honored.

James P. Tuttle, who was a general surgeon and the second president of our Society, occupied the chair of proctology at the New York Polyclinic from the date of its establishment in 1893 until his untimely death in 1913 at the age of fifty-six. It was my privilege and good fortune to be associated with this honest and able leader during the last eleven years of his life.

At the 1946 meeting of our Society in San Francisco, Dr. Curtice Rosser delivered the first Mathews Oration, entitled "The First Proctologist." This brilliant essay on the life and writings of Dr. Mathews should be read, treasured and remembered by every proctologist.

At the Golden Anniversary meeting in 1949 at Columbus, Dr. Louis J. Hirschman gave the second Mathews Oration, "The First Fifty Years of Proctology." He outlined most interestingly the history of the Society, gave a concise but vivid sketch of each of the thirteen original Founders and mentioned four epochs of our Society's achievement in the progress of American proctology. The last of these was realized on June 15, 1949, when the Council on Medical Education and Hospitals and the Advisory Board for Medical Specialties authorized the American Board of Proctology to function as an independent examining board. Independence assured a certain freedom but also imposed grave responsibilities.

The members of the Board deserve high commendation for their zeal in setting up educational and training standards for approved residencies and fellowships. The Council on Medical Education and Hospitals has approved several hospitals for residency training. Many more approvals must be obtained in order to meet the need for qualified proctologists. As I see it, the difficult problem is to obtain for the resident personal experience in major surgery, adequate to qualify him for certification. In most hospitals this experience can be obtained only with the cooperation of the general surgeons on the staff. Naturally, they may be reluctant to yield and would be justified unless a competent proctologist or a general surgeon, specializing in diseases of the colon and rectum,

were in charge. Hence it is both the privilege and the duty of every member of the Society to aid the Board in every way possible in its devoted labors.

This Fiftieth Anniversary meeting is a height from which to view the past and glimpse the future. Scientific advances since 1900 have been outstanding and in many respects phenomenal. For example, a new and significant concept has been developed in the fundamental subject of *perineopelvic* and *anorectal anatomy* by the researches of Gorsch, Levy and Courtney, our British confreres, Milligan and Morgan, and others, which clarify the paths of spread of infection and the proper surgical approach for its correction. Restudies of the bowel and pelvic lymphatics have added little to the classic work of Jameson and Dobson and of Poirier and Cunéo. Clinical experience has demonstrated that the aboral spread of rectal cancer is very limited. Dr. Cuthbert E. Dukes' contribution to the surgical pathology of rectal cancer is another classic.

*Proctosigmoidoscopy* should be employed more generally both in hospital and private practice (1) for inspection of the bowel, (2) to obtain material for smears and culture, (3) for biopsy and (4) to permit observation of the progress of the disease under treatment. The accurate diagnosis of tumors of doubtful nature, accessible through the proctoscope, can be made only by biopsy. If the neoplasm is polypoid and of moderate size, it can be removed intact with the electric snare; if sessile, destroyed by fulguration after a specimen has been taken. The early discovery and removal of these innocent appearing lesions is a major contribution of the proctologist to the prevention of the later development of cancer in the distal bowel. The importance of proctosigmoidoscopy and rectal palpation *prior* to a roentgenographic study of the colon should be stressed at every opportunity, especially at meetings of general practitioners. A competent proctologist should be a "must" on the staff of every general hospital.

The *Dysenteries* and *Colitides*. Again to quote Ecclesiasticus 38: 1: "The Lord hath created medicine out of the earth, and he that is wise will not abhor them. With such does He heal (men) and taketh away their pain." Development of the sulfonamides and discovery of the antibiotics, notably those from the soil molds, has revolutionized the treatment of the dysenteries and the colitides. Laboratory methods of early recognition of the organism predominant in the infection and prompt treatment, with the chemotherapeutic agent to which the pathogen is found to be most sensitive, would appear to be the scientific approach to accurate diagnosis and specific therapy. The consensus is that the dysenteries and the colitides, in the majority of cases, respond so favorably to early treatment with these comparatively new agents that the complications, especially the late, irreversible pathologic changes requiring major surgery, are prevented. Experience has shown the wisdom of limiting surgical intervention to the complications of these diseases. Neomycin has been reported to be of marked benefit in intestinal tuberculosis hitherto refractory to medical treatment.

*Inflammatory Rectal Stricture*. Experience with the antigen of Frei skin test shows that the vast majority of inflammatory strictures of the rectum is due to lymphogranuloma venereum (lymphopathia venereum). Chemotherapy checks the inflammatory process and thus tends to eliminate the complicating buboes and suppurating sinuses. Clinical studies suggest that chloromycetin may even have a specific action against the virus-like agent of lymphogranuloma venereum. With infection under control, management of the firm, fibrous stricture by dilatation and proctotomy is placed on a comparatively simple and safe basis and the number of cases requiring major proctectomy is greatly reduced.

*Diverticulosis* of the sigmoid is frequently asymptomatic but is revealed incidentally in a routine x-ray study of the colon. A bland diet and avoidance of drastic cathartics are useful prophylactic measures against the development of diverticulitis. Episodes of acute inflammation usually subside with rest, diet, antispasmodics and chemotherapy. Surgery is indicated only for the complications. In cases of extensive inflammatory infiltration of the bowel wall or the occurrence of a sigmoidovesical fistula, it is now generally agreed that resection of the involved segment with end-to-end anastomosis should be performed only after a temporary transverse colostomy has been established and the acute phase of the inflammatory process has subsided.

*Non-malignant Tumors*. The definite distinction between adenomas and papillomas is recognized. In cases of so-called familial multi-

ple polyposis of the colon there is no longer any question as to the necessity of early colectomy to forestall the inevitable degeneration of the adenomas into adenocarcinoma.

*Carcinoma* of the *colon* and *rectum* is still a major problem. In 1905 and again in 1924 I observed Mr. Ernest Miles perform his combined abdominoperineal operation at the Cancer Hospital, London, and Mr. Lockhart-Mummery perineal excision at St. Mark's. Their technic was so nearly perfect that few changes have since been made in these major surgical procedures. Babcock and Bacon have revived the operations of resection with preservation of the sphincters. Only time can compose the divergence of opinion as to the relative merits of the sphincter-saving and sphincter-sacrificing procedures. After all, complete removal of the tumor is of prime importance; the method of doing it is secondary. The technic of these radical operations is well standardized. The present trend is toward more extensive operations for cancer. However, it is imperative to remember that sound judgment rather than surgical skill or the feasibility of an operation should be the deciding factor for its performance. In cases of advanced cancer judicious neglect is frequently a greater service to the patient than an unwise operation. The safety of the operation and improved statistics in operative mortality and morbidity have been markedly enhanced by better anesthesia, better preoperative preparation and postoperative care of the patient, replacement therapy of protein deficiencies, fluid and electrolyte balance, vitamins, sulfa drugs and antibiotics, as indicated, to prevent and control infection; and improved surgical technic, including sutures of stainless steel wire as introduced by Babcock.

The last two decades have witnessed intensive efforts toward *cancer control:* (1) utilization of atomic energy and its products in the diagnosis and treatment of cancer; (2) the introduction of exfoliative cytology for the diagnosis of early cancer; (3) the development of cancer detection centers and (4) research in the basic sciences, especially as it is related to the cancer problem.

*Roentgen Ray* and *Radium.* The roentgen ray is invaluable in the diagnosis of lesions of the gastrointestinal tract and, with radium, has played an important role in the palliation and cure of cancer. Since irradiation therapy exacts discipline and experience in the special technic of its application and as facilities for acquiring this training are limited, probably very few proctologists are using the rays to the extent they merit.

During the decade that *atomic energy* has been available it has become an important agent in research. Certain substances, such as iodine, calcium and cobalt, when irradiated in the atomic pile, become radioactive substitutes for radium. They are named radio-isotopes and are available in many forms. They have been used in clinical tracer studies and therapy, notably radioiodine$^{131}$ in hypertrophies and tumors of the thyroid, and radiocobalt in the localization of tumors of the brain with the Geiger counter. Atomic energy and its products open a new field of medical research rich in promise.

*Exfoliative Cytology.* G. N. Papanicolaou, cell biologist at Cornell University Medical College, introduced exfoliative cytology in 1932, a technic of identifying a single cell or group of cells shed from a tumor as cancerous. The American Cancer Society has endorsed this method of diagnosis and in 1949 the Institute of Cancer Cytology, Inc., a non-profit organization, was chartered. A close correlation has been found between cytologic smears and biopsies in the female genital area and respiratory tracts, and in a lesser degree in the urinary tract. Experience, skill and special training in the examination of material are essential for the cytologist to make a trustworthy report. The findings in the intestinal tract are equivocal. Our chief reliance for the diagnosis of carcinoma of the intestinal tract still rests on physical and proctoscopic examinations with biopsy and x-ray.

*Cancer Detection Centers* and *Cancer Prevention Clinics.* A rather new departure in cancer prevention and control is the establishment of cancer detection centers and cancer prevention clinics to examine apparently well persons, especially those over forty years of age. There are now in the United States* 268 cancer detection centers and 165 diagnostic clinics. Among the many thousands of individuals examined cancer has been detected in 0.3 to 1.5 per cent, benign or potentially cancerous lesions in approximately 10 per cent and other conditions needing medical care in 40 per cent. The relatively few cases of cancer detected among the

* Cancer Services and Facilities in the U.S., 1950. PHS Publication No. 14.

total examined would appear to be prohibitive at a cost of $1,500 to over $3,000 for each case discovered were it not for: (1) the discovery of many other abnormalities, some of which mimic cancer in signs and symptoms, (2) the function of training many physicians in the technic of thorough examination as practiced at the centers and (3) education of the public on the importance of periodic examinations. The experience already gained would seem to indicate that eventually these facilities would become general centers for health maintenance.

Search for a *general biologic test* for cancer continues but no reliable test is as yet available. Biochemical tests are of value in the diagnosis of specific cancers, notably those of the prostate with bone metastasis, the adrenal and the thyroid glands.

*Research.* The basic cause of cancer, the inherent growth factor, just what causes the orderly growth of cells to become lawless, is still a mystery. However, high new hope appears on the horizon. Foremost among the agencies engaged in research are the Rockefeller Institute in New York, the American Cancer Society organized in 1937, the National Cancer Institute, established by the Government at Bethesda, Maryland, in 1937, and the Sloan-Kettering Institute for cancer research, opened in 1938 as a unit of the Memorial Cancer Center in New York City. These organizations and others, with staffs of eminent scientists, well equipped laboratories and adequate public and private financial support, are waging an all-out war against cancer from many angles, including biology, chemistry, physics and chemotherapy.

Now, since proctology has been fully recognized as a specialty and an independent Board established, *two other major objectives* loom on the horizon. Both are desirable. One of them may not be obtainable for some time; it is the establishment of a *hospital* for research, clinical teaching and the training of residents in proctology, comparable to St. Mark's Hospital, London. Such an institution located in a large city would stimulate general interest and be a firm foundation for the progressive advancement of the specialty. Several other branches of medicine have their own special hospitals. A hospital of this type would require large funds; let us hope that an "angel" will be found.

The other objective is more readily obtainable. It is the establishment of a *Journal of Proctology*. During the ten years prior to his untimely death, at the New York meeting of the Society in 1917, Dr. Rollin H. Barnes, of St. Louis, published The Proctologist, a quarterly, and by permission, included the Transactions. I believe that there is now an urgent need for an authoritative and representative journal, sponsored by the Society and published quarterly or bimonthly. There would be no dearth of material. Papers read at the annual meeting would supply the scientific articles for one or more numbers. Other desirable features might be special articles by honorary fellows, editorials by "guest" editors, book reviews and abstracts of important articles in the literature, adequate in completeness and scope to show the advances not only in proctology but also in allied sciences, such as bacteriology, physiology, pathology, biochemistry, cancer research and therapeutics. Under "news" should be stressed the activities of the sixteen independent regional proctologic societies. Thus the journal would be a strong link between these independent groups and our Society.

It is scarcely to be expected that the next fifty years will witness as great progress in scientific discovery as occurred in the past half century. Yet these spectacular discoveries and significant advances open new leads for further research which may solve many of the obscure problems still on our horizon. In the words of Browning: "Man's reach should exceed his grasp, or what's a heaven for?"

# ADENOMA OF THE RECTUM AND LOWER PORTION OF THE SIGMOID*

## A CLINICOPATHOLOGIC STUDY

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THIS is an analysis of histologic characteristics of adenoma of the rectum and of the lower portion of the sigmoid. For the purposes of the study histologic examination was made of 141 biopsy specimens with a diagnosis of adenoma. These specimens were reclassified histologically under the following headings: (1) adenoma, (2) adenocarcinoma, grade 1, in an adenoma, (3) adenocarcinoma unassociated with adenoma, (4) inflammatory hyperplasia and (5) inflammatory hyperplasia at the dentate margin. Following this reclassification, correlation with the clinical and proctoscopic findings was attempted. The operative specimens were compared and correlation of proctologic and surgical diagnoses was made.

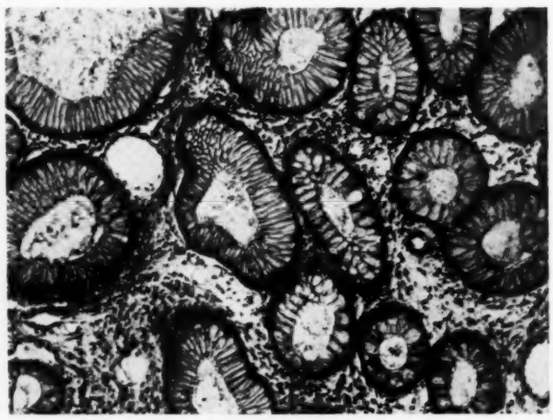

FIG. 1. Biopsy specimen with a final histologic diagnosis of adenoma; there are irregular acini with back-to-back arrangement in several instances; the acini show pockets and pouches. The nuclei are at the base of the cells and stain darkly; mitotic figures are scarce; very little inflammatory reaction is seen. Hematoxylin and eosin, × 100.

### DEFINITION OF CATEGORIES

For the purpose of clarity the following discussion of terminology is offered:

*Adenoma or Adenomatous Polyp.* Adenomas possess acini which are more irregular and larger than those of the normal mucosa of the colon. The irregularity of the acini is evidenced by pockets and pouches. The acini assume a relative back-to-back arrangement instead of being separated by tunica propria. The nuclei show some hypertrophy but occupy a basal position in relation to the rest of the cell. Mitotic figures are very scarce and may be absent. There may be hypersecretion of mucus. Rarely is there evidence of inflammatory reaction. In our series very few specimens fulfilled all of these criteria. (Fig. 1.)

*Grade 1 Adenocarcinoma in an Adenoma.* The gross counterpart of this lesion is the adenomatous polyp which has undergone so-called precancerous change. In this group the acini show a greater irregularity than do those in the first category and the cells are hypertrophied, elongated or compressed. The overgrowth may appear as multilayered buds. The acini assume the back-to-back arrangement and much of the tunica propria disappears. The nuclei are elongated and they are larger and stain more deeply than do those in the first category. A familiar characteristic is migration of the nuclei from the base of the cell. Mitotic figures occur with increased frequency. There is usually no evidence of inflammatory reaction other than slight lymphocytic infiltration at the base. Rarely, focal ulceration or necrosis may be present at the tip of the growth. Owing to marked vascularity, small hemorrhages may occur and hemosiderin-laden macrophages may appear in the stroma as evidence of trauma or hemorrhagic infarction. The lesion is situated on a moderately vascular connective tissue stalk, and usually the muscularis mucosa is continuous with that of the intestinal wall. It may contain scattered smooth muscle fibers in its

* Abridgment of thesis submitted by Dr. Cooper to the Faculty of the Graduate School of the University of Minnesota in partial fulfillment of the requirements for the degree of Master of Science in Proctology.

deeper structure. The stalk is covered with normal intestinal mucosa. Definite progression from normal mucosa to adenoma and thence to malignant metaplasia may occur at the junction of the stalk with the lesion. The stalk may be straight or frond-like. Occasionally stalks may become twisted and may cause hemorrhagic infarction of the polyps. Hypersecretion of mucus may occur. The mucus is normally extracellular. (Fig. 2.)

*Adenocarcinoma Unassociated with Adenoma.* Usually these lesions possess low grade malignancy. The outstanding characteristic is the irregularity of architecture and usually there is invasion of the basement membrane. The acini show irregularity of grouping and structure. Increased rate of growth is indicated by the appearance of more numerous cells of the acini and mitotic figures. The nuclei are large, hyperchromatic, elongated and have migrated from the base of the cells. There is a gradual change from normal structure to anaplasia at the margin of the lesion. (Fig. 3.)

FIG. 2. Biopsy specimen with a final histologic diagnosis of grade 1 adenocarcinoma in an adenoma. In the malignant portion the nuclei stain deeply, are elongated and show migration from the base of the cells. There is little evidence of an inflammatory reaction. The acini are irregular and show back-to-back arrangement. Mitotic figures are present. In the benign portion the cells are clear and have lighter staining nuclei, which are short and basal in location. The acini are irregular, though, and show back-to-back arrangement. Hematoxylin and eosin, × 100.

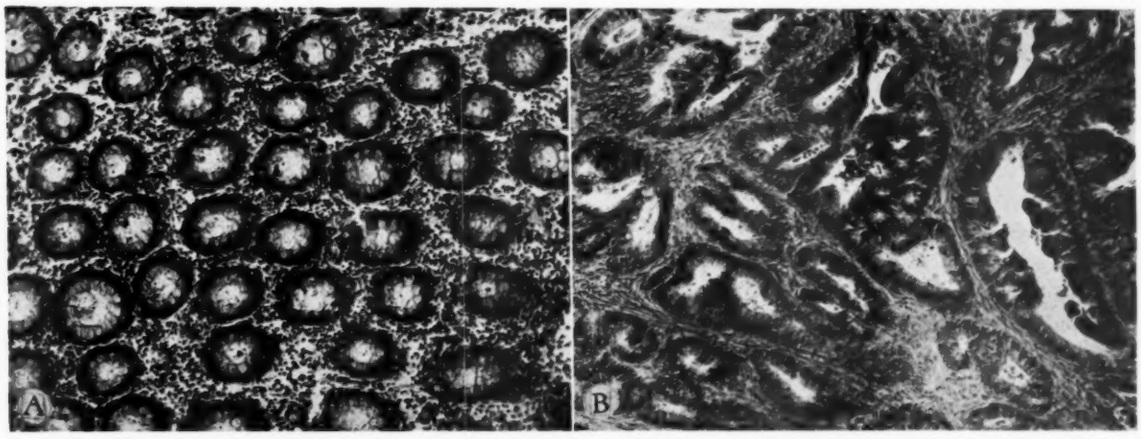


FIG. 3. A, Biopsy specimen showing the histologic picture of inflammatory hyperplasia. There is absence of any evidence of malignant cells. The first histologic diagnosis was inflammatory hyperplasia. Hematoxylin and eosin, × 100. B, section from a surgical specimen removed from the same patient seven days later showing the characteristics of grade 2 adenocarcinoma of the rectum. Hematoxylin and eosin, × 100.

*Inflammatory Hyperplasia.* Numerous polymorphonuclear cells and lymphocytes appear throughout the lesion. Eosinophils are prominent. Ulceration or necrosis frequently is present. The acini are more regular and are separated by inflammatory stroma, and back-to-back arrangement is not usually present. The nuclei are basal, not elongated and stain darker than do those of normal cells. Mitotic figures are scarce. Excessive mucus may be present. (Fig. 4.)

*Inflammatory Hyperplasia of Mucosa at the Dentate Margin.* In this group glandular epithelium meets squamous epithelium with some irregularity of the glandular mucosa. This may be the seat of an inflammatory process. The resulting epithelial hyperplasia tends to increase the irregularity of the glands. This should not be construed as a characteristic of malignancy. (Fig. 5.)

## MATERIAL AND METHOD OF STUDY

The material used for this study consisted of 141 routine biopsy specimens with a diagnosis

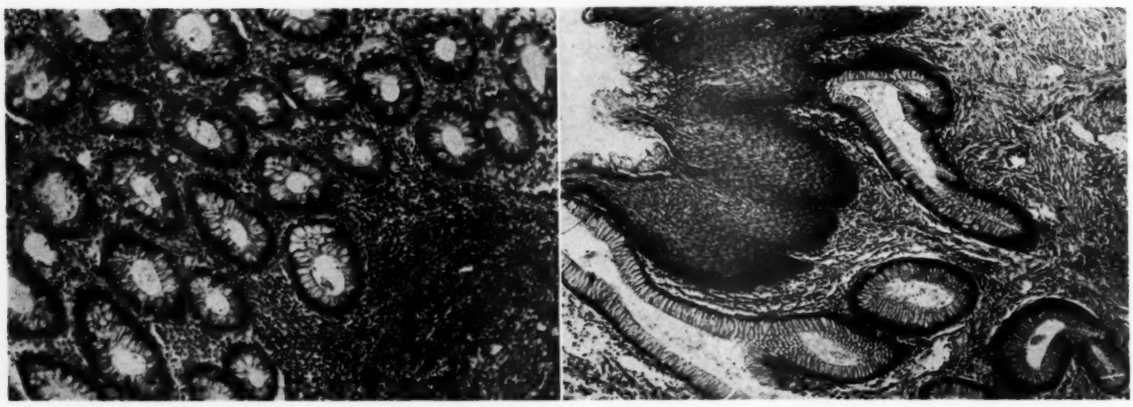

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FIG. 4. Biopsy specimen with a final histologic diagnosis of inflammatory hyperplasia. The acini are regular. The back-to-back arrangement of acini is not present. The acini are separated by numerous inflammatory cells. The nuclei are small and located at the base of the cells. Mitotic figures are very scarce. Hematoxylin and eosin, × 100.
FIG. 5. Biopsy specimen showing characteristics of inflammatory hyperplasia at dentate margin. The squamous epithelium and columnar epithelium are adjacent. The nuclei in the glandular epithelium are small, darkly stained and basal in position. Miotic figures are scarce. There is evidence of an inflammatory reaction as shown by the inflammatory cells in the stroma. Hematoxylin and eosin, × 75.

of adenoma. The specimens were selected from cases encountered by several different pathologists between May 17, 1919, and September 17, 1942. The tissue was stained with hematoxylin and eosin.

TABLE I

HISTOLOGIC RECLASSIFICATION OF 141 BIOPSY SPECIMENS WITH A BIOPSY DIAGNOSIS OF ADENOMA

| | Cases | Per cent |
|---|---|---|
| Neoplastic | | |
| Adenocarcinoma | 13 | 9.2 |
| Adenocarcinoma, grade 1, in an adenoma | 67 | 47.5 |
| Adenoma | 2 | 1.4 |
| Total | 82 | 58.2 |
| Non-neoplastic | | |
| Inflammatory hyperplasia | 54 | 38.3 |
| Inflammatory hyperplasia at dentate margin | 5 | 3.5 |
| Total | 59 | 41.8 |

The history of each patient was studied carefully with special reference to the sigmoidoscopic examinations and surgical procedures. All correspondence and subsequent reports were reviewed.

*Histologic Reclassification of 141 Biopsy Specimens with a Diagnosis of Adenoma.* On a purely histologic basis eighty-two (58.2 per cent) of the 141 specimens were neoplastic and fifty-nine (41.8 per cent) were not. (Table 1.) The largest group of the 141 biopsy specimens was that in which a diagnosis of adenocarcinoma, grade 1, in an adenoma was made. The second largest group of the 141 biopsy specimens was that in which a diagnosis of inflammatory hyperplasia was made. Many specimens in this group were similar to so-called pseudopolyps of chronic ulcerative colitis.

In five specimens glandular hyperplasia was observed near the point at which the glandular epithelium of the rectum meets the squamous epithelium of the skin of the anal canal. No evidence of adenoma or adenocarcinoma was found in these specimens. They were classified separately in order to point out the occurrence of this type of glandular hyperplasia at the dentate margin.

*Final Proctologic and Surgical Interpretation.* After each of the lesions had been reclassified histologically, the clinical records were studied with special reference to proctologic reports and surgical procedures. All additional specimens, such as resected carcinoma, were also studied. Correlation was then made between the re-

classified histologic diagnosis and the proctologic and surgical diagnoses.

The final proctologic and surgical interpretation in the group of thirteen biopsy specimens in which a diagnosis of adenocarcinoma was made on histologic reclassification was as follows: adenocarcinoma of the rectum, ten cases, adenocarcinoma of the lower portion of the sigmoid, one case and adenocarcinoma of the rectosigmoid, two cases. It should be remembered that in each of these thirteen cases the histologic diagnosis on routine biopsy was adenoma. The diagnosis of adenocarcinoma was made on the specimen obtained during a surgical procedure.

TABLE II

PROCTOLOGIC AND SURGICAL INTERPRETATION IN THE GROUP OF 67 BIOPSY SPECIMENS

| | Cases | Per cent |
|---|---|---|
| Malignant | | |
| Adenocarcinoma of rectum | 13 | 19.4 |
| Adenocarcinoma of lower part of sigmoid | 6 | 9.0 |
| Adenocarcinoma of rectosigmoid | 2 | 3.0 |
| Total | 21 | 31.3 |
| Polypoid lesions with malignant changes | | |
| Multiple polyps of rectum and lower part of sigmoid | 11 | 16.4 |
| Single polyp of rectum or lower part of sigmoid | 24 | 35.8 |
| Polypoid area of rectum | 10 | 14.9 |
| Polypoid lesion in chronic ulcerative colitis | 1 | 1.5 |
| Total | 46 | 68.7 |

The proctologic and surgical interpretation in the group of sixty-seven biopsy specimens in which a diagnosis of grade 1 adenocarcinoma in an adenoma was made on histologic reclassification is given in Table II. It is apparent that twenty-one of these specimens (31.3 per cent) originally given a biopsy diagnosis of adenoma actually represented adenocarcinomas and that forty-six represented polypoid lesions with malignant changes. (Table II.)

TABLE III

FINAL PROCTOLOGIC AND SURGICAL INTERPRETATION IN THE GROUP OF 54 BIOPSY SPECIMENS

| | Cases | Per cent |
|---|---|---|
| Malignant | | |
| Adenocarcinoma of rectum | 9 | 16.7 |
| Adenocarcinoma of lower part of sigmoid | 4 | 7.4 |
| Adenocarcinoma of recto-sigmoid | 3 | 5.6 |
| Total | 16 | 29.6 |
| Polypoid lesions | | |
| Multiple polyps of rectum and lower part of sigmoid | 10 | 18.5 |
| Single polyp of rectum or lower part of sigmoid | 10 | 18.5 |
| Polypoid lesion in chronic ulcerative colitis | 12 | 22.2 |
| Total | 32 | 59.3 |
| Inflammatory lesions | | |
| Inflammatory stricture of rectum | 1 | |
| Fistula-in-ano | 1 | |
| Benign ulcer of rectum | 1 | |
| Rectovaginal fistula | 1 | |
| Area of deformity in rectum* | 1 | |
| Indurated area in rectum* | 1 | |
| Total | 6 | 11.1 |

*Possibly the result of injection treatment.

In the two instances in which the original biopsy diagnosis of adenoma was confirmed on histologic reclassification of the specimens the final proctologic and surgical interpretation was that of a single polyp of the rectum in each instance.

The final proctologic and surgical interpretation in the group of fifty-four biopsy specimens in which a diagnosis of inflammatory hyper-

plasia was made on histologic reclassification is given in Table III. It is evident that sixteen of these specimens (29.6 per cent) with an original biopsy diagnosis of adenoma actually represented adenocarcinomas and that six (11.1 per cent) represented inflammatory lesions.

TABLE IV

FINAL PROCTOLOGIC AND SURGICAL INTERPRETATION IN THE GROUP OF 5 BIOPSY SPECIMENS

| | Cases |
|---|---|
| Malignant lesion | 0 |
| Polypoid lesion | 3 |
| Single polyp in the rectum | 2 |
| Polypoid area in the rectum | 1 |
| Internal hemorrhoids | 2 |

The final proctologic and surgical interpretation in the group of five biopsy specimens in which a diagnosis of inflammatory hyperplasia at the dentate margin was made on histologic reclassification is given in Table IV. It is interesting that in two cases the diagnosis was internal hemorrhoids although on routine biopsy it was adenoma. The proctologic report in both cases stated that the mucosa in this area was frosty in appearance. No malignant lesions were found in this group.

## COMMENT

The importance of determining the histologic nature of an adenoma lies in the fact that many a carcinoma has its origin in an adenoma. Robertson has stated that every adenocarcinoma arises in an adenoma. It is generally agreed by Buie,[4,5] Bargen,[1,2] Rankin, Klemperer, Lockhart-Mummery, Dukes, Stewart, Martin, Smith and numerous others that adenomatous polyps constitute one of the most dangerous predisposing factors in the development of rectal carcinoma. Too much emphasis cannot be placed upon the careful histologic examination of an adenoma.

Virchow said that polyps are a hyperplastic response of glands to inflammation. Verse stated that polyps are the result of chronic irritation in the presence of congenital predisposition. Rankin and Grimes advanced the theory that two types of polyps occur in the rectum and lower part of the sigmoid: one the result of inflammation and the other a congenital polyp or that type which investigators regard as a primary neoplasm.

It is well known that there is a definite hyperplastic response of epithelium of an organ to inflammatory conditions. An undermining ulcer in the colon may leave an overhanging portion which can form a pedunculated polyp-like tumefaction. In chronic ulcerative colitis definite hyperplasia has been observed in the glandular tissue. This condition does not develop a true adenomatous polyp but what is accepted as a pseudopolyp of hyperplastic mucosa.

Injection treatment of hemorrhoids apparently caused an inflammatory reaction with resulting glandular hyperplasia in two of our cases. The original histologic diagnosis was adenoma in both of these cases. The diagnosis on histologic reclassification was inflammatory hyperplasia.

In two cases a final proctologic and surgical diagnosis of internal hemorrhoids was made. The original histologic diagnosis by routine biopsy was adenoma in each case. The diagnosis on histologic reclassification was inflammatory hyperplasia at the dentate margin. Probably the glandular hyperplasia observed in these cases was owing to chronic inflammation.

All the biopsy specimens associated with a final proctologic and surgical diagnosis of fistula-in-ano, rectovaginal fistula, benign rectal stricture and benign ulcer of the rectum were found on histologic reclassification to represent inflammatory hyperplasia, despite the fact that the original histologic diagnosis made on routine biopsy was adenoma.

Broders has stated that benign penetrating epithelium is characterized by non-malignant hyperplasia that results from response to a stimulus. The epithelial cells in this condition, although they may penetrate far beyond the normal level of the junction of the epithelium and the connective tissue and may be greatly increased in number, retain the characteristics

of normal epithelial cells. Benign penetrating epithelium has been observed in healing wounds, in chronic ulcers and in simple chronic inflammation.

## SUMMARY AND CONCLUSIONS

This study was undertaken because it was thought that the histologic diagnosis of adenoma of the rectum and lower portion of the sigmoid made on the basis of routine biopsy was not always corroborated by the final proctologic and surgical diagnosis. Because of this 141 biopsy specimens from 141 patients with an original biopsy diagnosis of adenoma were reexamined. Each section of tissue was reclassified on the basis of histologic changes. An attempt was made to correlate the diagnoses made on histologic reclassification with those of the proctologic and surgical examination. Of the 141 lesions with an original histologic diagnosis of adenoma made by biopsy, later fifty proved to be adenocarcinomas, eighty-one proved to be polypoid lesions either with or without malignant changes, six proved to be inflammatory, two were adenomas and two were hemorrhoids.

It was found that those cases in which the biopsy specimen was reclassified histologically as adenocarcinoma unassociated with adenoma were cases of carcinoma of the rectum or sigmoid.

On histologic reclassification the diagnosis of adenoma, grade 1 adenocarcinoma in an adenoma, inflammatory hyperplasia and inflammatory hyperplasia at the dentate margin agreed more accurately with the final proctologic and surgical nature of the lesion than did the original biopsy diagnosis of adenoma alone.

It seems justifiable to recognize the histologic diagnosis of inflammatory hyperplasia in biopsy material. Especially is this true in ulcerative lesions, following some instances of injection treatment of hemorrhoids and in chronic internal hemorrhoids which have been subjected to chronic infection and trauma.

Increased care should be taken to distinguish between adenoma alone and adenoma that contains grade 1 adenocarcinoma.

It seems logical to use the term polypoid in the surgical or proctologic diagnosis of that group of lesions which may be histologically adenoma, grade 1 adenocarcinoma in an adenoma, inflammatory hyperplasia or inflammatory hyperplasia at the dentate margin.

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## DISCUSSION

Michael W. Holehan (Memphis, Tenn.): It has been very interesting to me to have the opportunity to read and study this paper in advance and to learn, therefore, the results of this study on polypoid tumors of the rectum and the lower portion of the sigmoid. Perhaps the outstanding notation I made was the relatively high percentage of error made on the initial proctoscopic biopsy material as judged from the final proctologic and surgical diagnoses. This apparently was true in the original diagnoses of the 141 cases as well as under the reclassified diagnoses by these authors. This point is not offered in the spirit of criticism but rather to point out the inherent degree of error in the biopsy approach toward the diagnosing of this type of lesion in this region. It is obvious from this paper that the final diagnoses in these cases did not rest solely upon the opinion of the pathologist. I am sure this is the experience of proctologists in general who, therefore, must

evaluate any single case by all of the findings including those of the biopsies.

Secondarily, it occurred to me that since it is reasonably well established that benign polypoid neoplasms of the colon and rectum are frequently multiple and also lead to the development of overt carcinoma, it is highly desirable, therefore, to distinguish the pseudopolyps and inflammatory polyps from true adenomas in any one patient.

In regard to the proposed reclassification of these lesions by these authors, I am wondering why they divided the epithelial polypoid neoplasms into adenomas and adenocarcinomas, grade 1 arising in an adenoma. According to their findings the pure adenoma was seen twice in this group of 141 cases whereas the adenocarcinoma, grade 1, in an adenoma occurred sixty-seven times. Do they manage the two types of lesions differently? In the type of institution in which I practice I fear that the report by the pathologist of any form of carcinoma would often constitute a directive to the surgeon to treat adenocarcinoma, grade 1, in an adenoma radically. I am well aware, however, that these authors are members of a closely organized group wherein a more common understanding of these terms is more easily attained. Also, I should like to know what is the patient's chance later to obtain life insurance after he has been given the diagnosis of adenocarcinoma, grade 1, in an adenoma. If the treatment of these two types of epithelial polypoid lesions is alike, and since not all of these grade 1 adenocarcinomas invariably become overt cancers, perhaps it would be better to recommend the simple term of adenoma to cover both of these groups. Furthermore, in the light of the rather significant error in biopsy diagnoses in this group of lesions, I would suggest a classification aimed primarily at separating the non-neoplastic polypoid lesions from the neoplastic ones and breaking the latter group into benign and malignant lesions.

I would like to close with one additional thought and that is concerning the wisdom of terming a precancerous change as adenocarcinoma, grade 1. I know that this raises a point that is often fervently discussed, but to me the use of the word carcinoma should by definition imply an invasive lesion unless it is preceded by some qualifying phrase as preinvasive or intra-epithelial. I cannot take time to discuss this point further but our gynecologic colleagues have in recent years tried to settle this point in reference to the cervix without any uniformity of opinion. I believe, however, that the principle applies in these lesions of this paper and I am merely expressing my own personal belief toward such terminology.

ROBERT A. SCARBOROUGH (San Francisco, Calif.): In the report we have had sixty-seven of eighty-two patients with adenomas who were diagnosed as having carcinoma. That represents a percentage of 81.7. Our percentage figures of diagnosis of carcinoma are quite different. In our cases 7 per cent have been called carcinoma. Now, there is obviously a marked difference here. It is not a matter of quibbling about diagnosis but it is an important practical problem for all of us as clinicians in handling this type of patient.

The early changes called adenocarcinoma grade 1 we call adenoma because clinically those are local lesions, not invasive, not metastasizing and can be treated by local removal. When the microscopic findings are those of an invasive tumor, whether it invades the stroma or the muscularis mucosa, we consider that carcinoma, because we know that such tumors, even when a few millimeters in size, can metastasize to the pararectal nodes and, therefore, must be treated radically as carcinoma.

If we are to stick to the principle that we have that carcinoma requires radical resection, we will be forced to perform radical resection of the rectum in 82 per cent of the patients with adenomatous polyps of the rectum. We would be making a serious error for the following reason: We prefer to classify the cases here reported as adenocarcinoma grade 1 as adenomas with premalignant changes which can be treated safely by local removal only.

WILFORD L. COOPER (closing): It might be pointed out that this study was taken from biopsies for a period from 1919 to 1942. Of course, our histologic studies, some of the grading of these lesions and a great number of things have changed during that period of time. Our criteria for adenomas was very severe but this was our plan. Adenocarcinoma, grade 1, in an adenoma is always a controversial subject. We have pointed out that the histologic diagnosis of adenoma, grade 1 adenocarcinoma in an adenoma, inflammatory hyperplasia and inflammatory hyperplasia at the dentate margin agreed more accurately with the final proctologic and surgical nature of the lesions than did the original biopsy diagnosis of adenoma alone.

# MAXIMAL DIAGNOSTIC POTENTIAL OF BARIUM ENEMA IN THE MANAGEMENT OF COLON DISEASE*

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*Grand Rapids, Michigan*

THE dangers which attend incomplete diagnostic efforts are particularly serious when diseases of the large bowel and its outlet are present. Too frequently, hemorrhoids which are present in so many patients are treated by removal with complete disregard for more important lesions of the rectum and colon.

Commonplace errors of oversight can be obviated by careful history-taking, thorough physical examination and deliberate proctosigmoidoscopic examination. If any one of these diagnostic steps yields suggestive evidence of intrinsic abnormality, further investigation becomes mandatory. If all three procedures clearly indicate that the patient is normal in other respects, it is still wise to employ one additional diagnostic procedure before assuming that hemorrhoidectomy will constitute adequate treatment. This procedure, x-ray examination of the colon during and following the injection of barium per rectum, constitutes a most important addition to the customary proctologic diagnostic steps.

A series of 600 cases has been accumulated in which the standard diagnostic procedures have suggested no intrinsic abnormality and in which barium enema x-ray examination of the colon has been done and may be considered strictly adjunctive. All 600 patients sought medical aid for the relief of real or fancied anal distress. If any patient had a history of change of bowel habit, tarry stools or weight loss, he was excluded from this series. The presence of a palpable or visible tumor in the lower bowel or of abnormal mucosa, lumen or bowel content rendered subsequent x-ray examination mandatory. This patient, too, was not included.

It is emphasized that this study is not a survey in the usual sense of the word. It is an attempt to assess the value of the barium enema in a large group of patients who, by thorough clinical examination including proctosigmoidoscopy, have shown no evidence of intrinsic colon disease.

The study was started on the arbitrary premise that any patient forty years of age or over, who is considered under the criteria of the standard diagnostic procedures as a candidate for hemorrhoidectomy, must also be considered as a candidate for barium enema. There was at first some misgiving due to the fact that in dealing almost entirely with private patients there would be reluctance on the patient's part to pay for a procedure which was not clearly indicated. This misgiving was promptly dispelled by the universal and ready willingness of the patient to cooperate. The sharp limits of the study have widened almost unnoticeably until its edges are indistinct and many individuals less than forty years of age are included.

All radiographic studies were done by qualified roentgenologists. In seventy-four of the total 600 cases completely unsuspected abnormalities of the colon were found. This group constitutes 12.3 per cent of the entire series. Seventy patients (11.6 per cent) were found to have diverticulosis of the colon of minimal to severe degree. Of these seventy, twelve patients (2.0 per cent) showed evidence of diverticulitis of varying degree, despite the fact that these patients were asymptomatic at the time. Four patients (0.66 per cent) were found to have intrinsic new growths of the colon. There were three solitary polypi of the colon and one large carcinoid of the cecum. Thus sixteen patients (2.7 per cent) had colon abnormalities of real clinical significance.

A short résumé regarding the cecal carcinoid is reported herein as a case in point:

### CASE REPORT

H. L. No. 25283, a fifty-four year old white male, was first seen in this clinic on November 21, 1949. At that time the chief complaint was "piles" of one year's duration. There was a history of occasional fresh, red bleeding from the rectum with bowel movement. No history of tarry or clay-colored stools, weight loss, abdominal distress, change in normal bowel habit or jaundice was evinced. The patient's appetite

* From the Ferguson-Droste-Ferguson Rectal Clinic and Hospital, Grand Rapids, Mich.

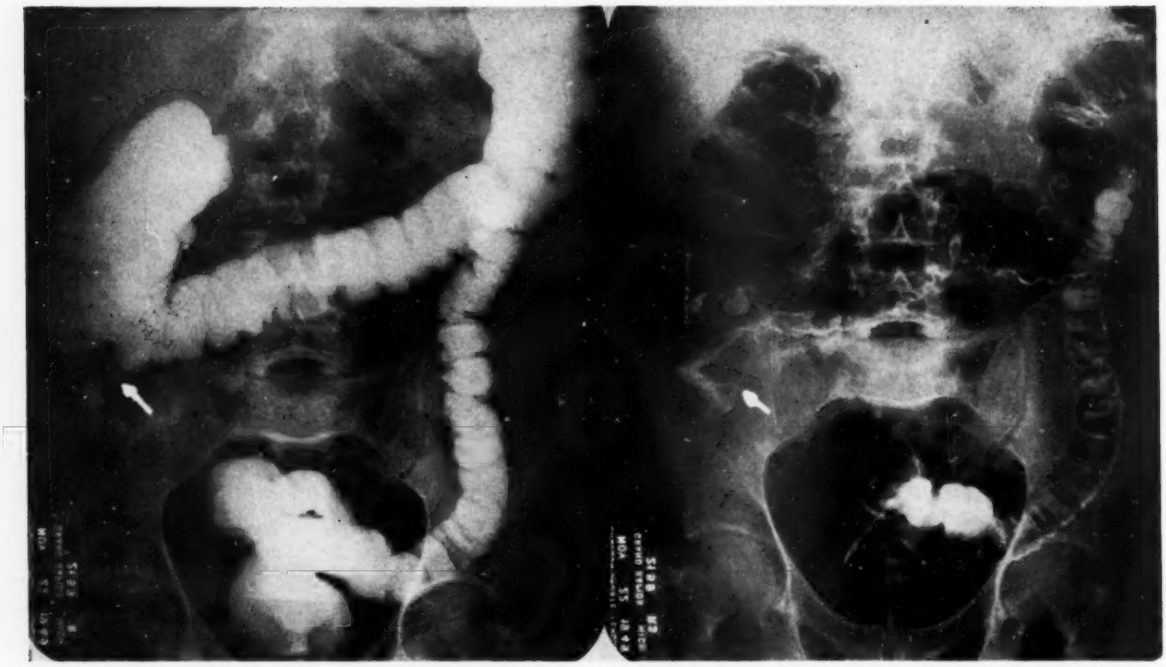

FIG. 1. Patient H. L., barium-filled colon and contrasting air-filled colon showing a 3 cm. defect indicative of a mass extending into the lumen from the medial cecal wall.

was excellent and unchanged and no qualitative food idiosyncrasy was present.

Physical examination showed the patient to be a well developed, well nourished, white male of approximately his stated age. General examination revealed edentulism and a right lower quadrant abdominal scar explained as a result of appendectomy twenty-two years before. Anorectal examination revealed large internal and external hemorrhoids with active internal hemorrhoidal bleeding. Proctosigmoidoscopic examination to 22 cm. revealed a normal mucosa and lumen, with the exception of melanosis coli.

Laboratory findings were as follows: Routine blood and urine examinations were normal and the Kahn serologic reaction test was negative.

Hemorrhoidectomy preceded by routine barium enema x-ray examination of the colon was advised. This procedure was done on November 22nd, using the double contrast technic and a probable soft tissue mass within the tip of the cecum was reported. A confirmatory barium enema with air contrast was done on November 25th and a 3 cm., oval, polypoid lesion in the medial portion of the tip of the cecum was unequivocally reported. (Fig. 1.)

Abdominal operation was advised and right colectomy with ileotransverse colostomy was carried out five days later. There was no evidence of local or distant extension of the tumor. The patient's recovery was uneventful.

Pathologic findings were as follows: Grossly, the specimen consisted of a cecum, with a portion of ascending colon 12 cm. in length and 15 cm. of distal ileum. (Fig. 2.) In the distal portion of the cecum just under a small scar, presumably from removal of the appendix, was a round, smooth, elevated 4 cm. firm tumor which was pushed out from beneath the mucosa but did not appear to be part of the mucosa. At one side of the tumor was a small indentation as though representing the appendiceal base, although this was not definite. Microscopically, sections through the cecal tumor revealed a malignant growth composed of thick intertwining cords of well differentiated polyhedral cells of uniform pattern which were growing luxuriantly throughout the layers of the gut wall, having reached the mesocolon at their furthest extension. No transition from the goblet cells of the colonic glands to the tumor could be demonstrated; rather the tumor appeared to have eroded through the mucosa at its center, with peripheral undermining. There was remarkably little inflammation associated with the lesion and the satellite lymph nodes were free of tumor tissue.

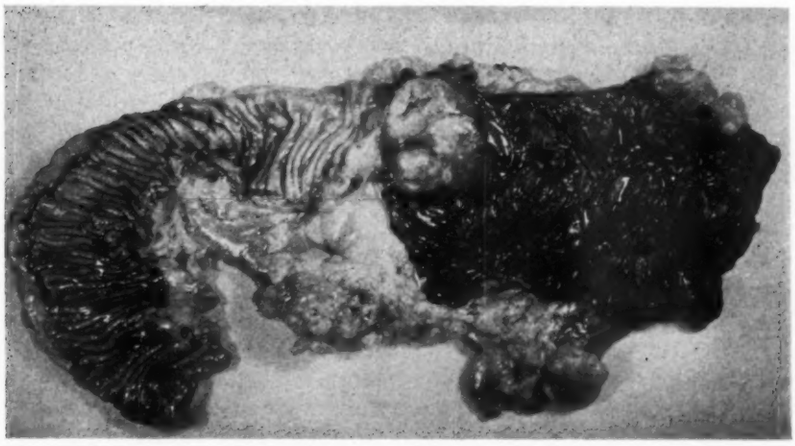

FIG. 2. Patient H. L., terminal ileum, cecum and ascending colon showing neoplasm of cecal wall.

Pathologic diagnosis was carcinoid of the cecum. The histology of the tumor is typical for carcinoid and its location suggests an origin from the appendiceal stump.

## SUMMARY

In a series of 600 patients with anorectal disease the history, physical examination and proctosigmoidoscopic examination ruled out any suspicion of intrinsic colon disease. Adjunctive barium enema studies, however, revealed that 12.3 per cent of these patients actually did have abnormalities of the colon and that 2.7 per cent of the entire series had unsuspected and clinically significant colon disease.

Four operative procedures were performed. Colotomy and polypectomy were done in three patients and right colectomy and ileotransverse colostomy were performed in one. The polypi, by pathologic study, have been completely excised and are benign in character. None of the patients with diverticulosis and diverticulitis required operation.

It is reassuring that no carcinomas were discovered in this particular series. However, it is obvious that small asymptomatic carcinomas will be detected in no other way.

## CONCLUSIONS

The maximal diagnostic potential of barium enema x-ray examination of the colon is emphasized in this study of 600 carefully screened patients. It is hoped that the procedure will become an integral part of the diagnostic armamentarium of all those who deal with anorectal disease.

## DISCUSSION

GEORGE D. VAUGHN (Richmond, Va.): It is with a good deal of reluctance that I voice my views on the routine use of barium enema studies in proctologic patients. Granted that it is a relatively safe procedure, it is not without some attendant danger. There have been many cases reported of rupture of the bowel wall, rupture of the diverticula and other complications, and I do not believe that the examination is to be entered into lightly.

The infallibility of barium enema studies has been greatly overemphasized. In the past year fourteen clinic and private patients with known carcinoma of the rectosigmoid and sigmoid by sigmoidoscopic examination were examined by barium enema with air contrast in an effort to locate multiple lesions. In two of these patients the radiologist was unable to demonstrate the lesion. Everyone agrees this is often true in the case of small polyps.

Inasmuch as four patients of the 600 reported by Dr. Ferguson showed evidence of upper large bowel surgical pathologic disorder by radiographic studies, and these without subjective or objective signs or symptoms, it seems to me extremely important that in those patients who present even the mildest suggestion of unknown bowel lesions that we insist on further examination.

A significant point in an attempt to analyze this paper is that if we were to take the first 600 people passing into this hotel and have barium enema studies done the incidence would be even higher than reported by Dr. Ferguson, because there would be a few in that group who would

present some signs and symptoms and they would automatically have been excluded in Dr. Ferguson's group.

It would be an ideal arrangement if everyone, particularly those over forty years of age, could have a barium enema examination, bronchogram, urogram and gastrointestinal series done, but obviously this is not practical.

MICHAEL W. HOLEHAN (Memphis, Tenn.): I cannot let this go by without heartily endorsing everything Dr. Ferguson has said. The colon, as you know, is a silent organ. Occasionally you have a few symptoms which will point out a malignancy or the presence of a growth.

I recommend that a very careful history be taken of every patient regardless of what he has. If there is the least suggestion of a change in bowel habits, of blood or mucous, I recommend that the patient have a thorough rectal and high sigmoidoscopic examination.

I disagree with Dr. Vaughn. People of this day and time are extremely cancer-conscious. All you have to do is to raise a slight doubt that there might be some trouble higher in the colon than you can reach with the sigmoidoscope and they will usually have an x-ray examination. When I say x-ray examination, I do not mean just any x-ray examination. Know your x-ray man. I have found that some x-ray men will give you a high percentage of lesions which are confirmed at operation, whereas other cases of bad malignancy are completely missed.

Your patient must be thoroughly prepared for examination. All form of feces and everything have to be completely eliminated, and these examinations must be very carefully studied. I cannot recommend anything more highly than the contrast enemas. Some x-ray men do not believe in this type of enema. I have known from experience over quite a few years of colon surgery and examinations that a contrast air enema will show up many lesions that the average x-ray man has missed.

JAMES A. FERGUSON (closing): Dr. Vaughn mentioned the first 600 people who walk in the front door. I would like to refer to a pure survey type of colon study which came to my attention. I was looking for something like this for a comparison with this series and the really purest survey I could find was that which was done by Dr. Marie Ortmayer and Dr. Marie Conley in the cancer prevention center at Women's and Children's Hospital in Chicago. The cancer prevention center admits only women who consider themselves well and who have no symptoms suggesting cancer. Of the 1,014 patients examined only two such tumors, that is polypi, were diagnosed by the roentgen method. One tumor was low in the ampulla and had been seen previously at proctoscopy. This case would have been excluded from my series. The other tumor was in the transverse colon for which the patient has not been explored to date. This latter patient also harbored a benign polyp found by sigmoidoscopy at 15 cm. height, and would also have been excluded from my series.

We have 1,014 women who were examined by the barium enema. There age group was a little wide; their mean age was forty-three, ours was about fifty-four. No polyps were found.

I am grateful to Dr. Holehan for his remarks about faith in your roentgenologist. We have two roentgenologists who do all our work. Therefore, their results are consistent and I certainly do have the greatest faith in them.

# AMINO ACID THERAPY FOR PRURITUS ANI

LAURENCE G. BODKIN, M.D.

*Brooklyn, New York*

IN a large proportion of pruritus ani cases it seems safe to assume that an irritant is leaking from the anal canal on to the surrounding skin. The fact that the involved skin is in immediate contact with an orifice of the body and that it becomes more irritated after a bowel movement seems to confirm this impression. This principle has been used in making up a formula for a local application for pruritus ani. Neutralization of the irritant and protection of the perianal tissues have resulted from its use.

The actual irritant causing the pruritus has always defied analysis. However, I believe it is now possible to describe some of its chemical properties, to state its effect upon the skin and often to neutralize the irritant itself before it damages the perianal tissues.

Partly by accident an observation was made which threw considerable light upon these chemical properties. Postoperative patients following hemorrhoidectomy or fistulectomy unrelated to pruritus ani reported a small amount of postoperative bleeding. It was of superficial nature, arising in the granulation tissue of healing wounds, but it caused some alarm to the patients. To stop this I advised them to apply tannic acid ointment. After a week I was surprised to find that the wounds had developed prominent white edges and that there were also many white ridges of skin throughout the area. It formed a picture very much like that of pruritus ani. These surgical cases had never been pruritic and I suddenly realized that I had produced this appearance of the skin by application of a protein precipitant, tannic acid.

Further experiments were made and one group of chemicals was found which not only precipitated proteins but also caused a certain amount of itching. It was found that compounds containing ammonia, especially ammonium oleate, could occasionally cause pruritus. Whether or not there is an excessive amount of ammonia in the stools of pruritic patients, I do not know. There is just a possibility of some chemical relationship here.

To counteract this type of irritant and afford local relief it was realized that some form of protein must be applied. By this means the proteins of the skin would be spared and the irritant would be absorbed. Because of the surface fluids so often present in pruritus another requirement was that of isotonicity.

Various protein compounds were tried and finally amino acid mixtures were found most satisfactory. However, severe irritation occasionally resulted even from these applications and further study was required.

Fom this point on I was aided by a research chemist, Mr. Edgar Ferguson. He made up various amino acid mixtures using a polyethylene base. Certain amounts of separate amino acids were added to the basic formula. Clinical observations were then made and it was noted that no single amino acid increased the speed or degree of relief. Instead, some of them, especially methionine and cystine, made the itching much worse. This was rather discouraging but soon the obvious solution suggested itself; methionine and cystine were extracted from the mixture and reduced to a minimum. With polyethylene base this made a highly satisfactory ointment. In all but a few cases of pruritus it has given relief within a few minutes. The application has to be repeated, of course, as the itching recurs and sedatives may have to be given to those patients who are highly emotional. However, control of the problem of pruritus ani is obtained early whenever temporary relief can be afforded so quickly.

Improvement in the skin occurs fairly rapidly and can be observed and photographed. In those who respond satisfactorily the whitened areas of skin disappear and the fissures between them heal. The skin becomes less fibrotic and finally regains normal elasticity. In a large proportion of the cases the amino acid ointment was discontinued after several weeks. Patients found that prompt use of this application at a time of threatened recurrence seemed to prevent damage to the skin.

In conclusion it can be said that a large percentage of patients with pruritus ani have some irritant seeping from the anal canal onto

the perianal skin. The irritant that has been studied in this report is able to precipitate protein, is possibly related to ammonia and its compounds and can be neutralized or absorbed by a special amino acid mixture.

DISCUSSION

ROBERT C. TOWSE (Albany, N. Y.): The research done on amino acids has given us one of the several great advances in therapy in the past few years. The story of the investigators who have solved the mysteries of the protein molecule, isolated and made the components of proteins suitable for clinical use is a fascinating one and they have made vast contributions to medical progress in this century.

Dr. Bodkin may have recognized another possibility of the application of the amino acids and his work should prompt those in research and clinical medicine to investigate further. However, there are some angles that can be questioned and need some explanation in spite of his finding a compound that alleviates this tormenting symptom. The most revealing and interesting phase of his work is that the majority of patients have been given relief within minutes. Even though there have been recurrences after a few weeks it might possibly be a step in the right direction. Continued studies and time will be the determining factors in the acceptance of this newly suggested treatment. Perhaps we are at the eve of a new era, one in which the druggist, the detail man and even our incorrectly informed colleagues will no longer offer suppositories for pruritus ani.

Dr. Bodkin mentions the ammonium content of the feces and this should offer a challenge in establishing the cause of pruritus ani.

If the amino acids applied to the skin will neutralize an exudate from the bowel, why should it not be given by mouth to prevent the manufacture of it in the intestinal tract? The formula has not been given and we would like to know what amino acids are used. What are the percentages of cystine and methionine and others of this group? The amino acids are a favorable culture media for many bacteria and it might be possible that the base used was bactericidal. A polyethylene base was mentioned but not named. Does the pruritic skin of a patient who has had an abscess with a resultant fistula in which a streptococcus, staphylococcus or a colon bacillus was cultured yield to this type of therapy? Is your form of treatment applicable to the irritated skin of a patient with ulcerative colitis and does it afford temporary relief or hold the symptoms in abeyance? Have you tried the base without the amino acids as control? Will pruritus caused by fungi or allergies respond? Is a neuro-dermatitis or a chemical dermatitis rendered asymptomatic?

I hope, Dr. Bodkin, that your interest in this study will be sustained. Your initial approach may be based on a sound and sensible premise. Your results will be watched carefully.

F. B. BOWMAN (Hamilton, Ontario, Canada): This is particularly interesting to me because during the past month I have seen a number of patients who have fallen into the group mentioned by Doctor Bodkin. Gabriel a short time ago stated that 80 per cent of night scratching was due to the presence of thread worms and he advised routine treatment for this condition. Since then after a search for embryos I put these patients on a week's treatment with gentian violet whether the embryos are found or not. After one week's interval they are given another week's treatment. It is surprising the number of patients who immediately clear up.

Allergy has been mentioned. I have found that three or four foods are frequently the culprits. Inquiry is made as to whether chocolate, peanut butter, margerine or honey is used. The question is asked, always, "Are you a coca cola drinker?" I think of a doctor who consulted me in such a state that he was considering giving up practice. On questioning him I found that he was a confirmed chocolate eater. The condition was as bad or worse than any discussed by the speaker. In a very short time he was perfectly well after stopping his chocolate. If he takes an ABS & C coated laxative tablet it will throw him into a spasm of pruritus ani. A young lady with pruritus was cancelling her arrangements for entering a training school. When she stopped drinking coca cola the condition disappeared. Peanuts and even margerine have been frequent causes in my experience. Of course any anorectal pathologic disorder must be taken care of. Amino acid therapy may be a great help if treatment for thread worms and allergy has been ineffectual.

WILLARD H. BERNHOFT (Buffalo, N. Y.): I would like to mention the most common

irritant that we see in our patients is the fingernail. As long as the patients scratch, they will continue to itch. The question I wish to ask is, does the doctor give his patients any instructions at all other than just the use of the protein or the amino acid ointment?

LAURENCE G. BODKIN (closing): Dr. Towse asked about amino acids by mouth. I was very much interested in his attitude and his research on this. He has certainly gone into this deeply. I did try amino acids by mouth in many cases and had no success. Apparently the digestive processes change the amino acids and by the time they reach the rectum their end products do not help. I did try that. The base is bactericidal. It is one of the high molecular alcohols. The point that Dr. Towse brought out is very important because I did use a faulty base at first and found within two weeks the amino-acid mixture broke down, became foul and irritating. Although I did not test the salve for bacteria, it was so irritating that it even brought back the pruritus. Carbowax is the base. I think it is commonly known as one of the high molecular alcohols and it does seem to be bactericidal.

The doctor spoke of ulcerative colitis. This salve does help to stop some of the rectal irritation. I have used it with ulcerative colitis for soothing around the rectum. I have used it in colostomies, in ileostomy and it does neutralize a good deal of the irritation there, so much so I have given up the aluminum compounds which I used to use for that purpose.

As to fungi I do not know much about it. Most of this group of mine, this large group, did not have actual fungus infection. We see now a good many people with irritation around the rectum due to taking aureomycin, terramycin or other antibiotics. I have only seen a few cases myself but several men in town have seen more. I first used the amino acid salve on a dentist in my building to relieve an aureomycin reaction. His pruritus around the rectum was cleared up rapidly, within a couple of days, to my surprise, although I haven't the faintest idea why. I do not see the rationale at all. The relief was obtained within a few minutes so the relief must have been a chemical neutralization, certainly nothing more than that. He continued to use the salve a few days and his skin was clear. I do not think the amino acids were affecting the fungi.

The base only was used, of course, as a control. I had many people to whom I gave a couple of different jars without explanation. I simply put initials on the jar. I tried the carbowax base and tried other bases alone without amino acids but did not have success. Sometimes when the patients returned, I gave them the powder to dilute and make into a paste and rub that on, and that did give them relief. I think the amino acid in sparing the skin protein is the active agent.

Itching at night with pinworms is common. It is well known and I guess many patients have pinworms. Just lately I have not seen patients with pinworms so I cannot say if this helps them or not.

Those among this pruritus group who do wake up at night with itching and scratching who have some of the ointment handy and put it on, tell me they can go back to sleep again. Apparently, in those instances it is a chemical neutralization.

Dr. Bowman was dead right in thinking of the diets, allergies and all that group. That is terribly important and, as he mentioned, chocolate is one of the greatest offenders in the whole group and it will cause pruritus. Restriction of it will help. The greatest offender of all is alcohol. I have had people test themselves to see how quickly alcohol had an effect. They said within a few hours and certainly by the next morning the pruritus was back again. The only way I can figure alcohol works is that it must work through its stimulation of the central nervous system and in turn be related to this emotional disturbance.

I have not put much stress on the question of fingernails. I have had the feeling scratching is almost a reflex. These people do it in their sleep and no matter how I tell them not to scratch, it does not do much good. Instead, I tell them to put something on quickly at the first instant of the itching. I think if they will wait a few minutes maybe they can resist the temptation to scratch. That would be the best thing.

They are advised on diets and many of these other things.

Thank you very much for the discussion. I hope that while this is only a preliminary study of this whole angle, if we do all get together maybe we can help these patients a good deal more.

# SURGICAL MANAGEMENT OF IDIOPATHIC PRURITUS ANI

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MANY cases of pruritus ani are of undetermined etiology and are unusually refractory to the usual methods of treatment. The exact percentage of cases in this category is unknown. It is not the purpose of this paper to discuss the etiology of pruritis ani. It is probably a fact that for any given case of anal pruritus a definite cause can be discovered if sufficient time and effort are given to the investigation. In actual practice the patience of the physician as well as that of the patient is frequently exhausted long before a solution is found. Regardless of how exhaustive the studies on these patients may be or how intensive the treatment, there will be many patients who will go on for many years without relief. This group provides a real challenge to the physician and an effort at definitive surgical treatment is justified.

For this study only patients with chronic pruritus ani demonstrating a typical thickening and lichenification of the skin of the perianal region were selected for surgical treatment. Furthermore these patients were carefully examined for the presence of a local pathologic condition and constitutional disease which could cause itching. The majority of the patients had undergone medical or surgical treatment over a period of many years. This treatment consisted of local applications, alcohol injections, x-ray therapy, various types of conservative anorectal surgery or a combination of these methods. The point I wish to emphasize is that these patients had exhaustive diagnostic studies and intensive treatment along the more conventional lines without significant relief. Patients of this group need more help than they have hitherto received. We must not fool ourselves by believing that the patient who does not return to keep an appointment has been cured by the fungicide we prescribed. The patient has sought advice elsewhere.

For the purpose of this investigation the literature relating to the surgical treatment of idiopathic pruritus ani has been reviewed. Repetition here would not add value to this report. At the end of the nineteenth century surgeons advocated removal of all itching skin as well as the terminal inch of intestine for this disease. It is not surprising that few patients submitted to this form of treatment. A few years later more conservative surgery was advised. Neurotomy was devised and later modified to include radial incision, to replace the circular incision originally advised which was so prone to cause sloughing of the skin. Through the years other procedures were devised which were neither as radical as the original procedure described nor as conservative as simple neurotomy. The tendency seemed to be to remove more and more of the diseased skin. None of the modern surgeons has advocated complete removal of all or practically all diseased skin.

For a number of years I have observed that in patients subjected to removal of the entire anal margin in the course of hemorrhoidectomy heavy scar formation was prone to develop, with resultant stricture and the unpleasant symptoms related to it. This procedure naturally is not justified for the cure of hemorrhoids. However, I thought it might be an ideal procedure for the treatment of pruritus ani provided that the scar formation could be eliminated. For this reason I subjected patients to the removal of practically all the itching skin in stages. The results have been excellent. Scar formation is hardly perceptible. The new skin is soft and pliable. Epithelization is perfect. The patients do not complain of seepage.

The technic is simple. (Fig. 1.) Elliptical areas of skin are removed from each quadrant. Strips of skin are allowed to remain between the denuded areas. Hemorrhoids or other anorectal pathologic conditions may be corrected at the same time that the surgery for pruritus ani is performed. After an interval of several months when all denuded areas are epithelized the remaining pruritic skin is removed, usually as an office procedure. This, of course, means the strips of skin originally allowed to remain are removed at this stage. The patient does not usually lose time from his work for the second procedure. Clinical experience proved that there is a vast difference in results when all the

skin of the perianal region is removed in one stage compared to the two-stage procedure. The end result of the former procedure is poor healing. This needs no emphasis as all of us are aware of the unpleasant results. On the other hand, an equal amount of skin may be removed by the multiple stage procedure without ill effects. After healing has taken place, the anus appears and functions perfectly normally. The new skin is of normal thickness and texture. Similar results could not be achieved by skin graft or by sliding skin from the buttock over the denuded area.

Before going into details regarding the histopathologic changes in pruritis ani it is pertinent to emphasize the normal histology of the skin of the anus. The skin in this area does not differ from true skin elsewhere. It is made up of an epithelial layer and derma. The epithelial layer is made up of several layers from without inward as follows: the horny layer which consists of layers of flattened horny cells; the stratum lucidum consisting of transparent nucleated cells; the stratum granulosum consisting of flattened granular cells; the stratum mucosum consisting of pigmented columnar cells, the outer part of which is covered with prickles, forming the prickle layer; the stratum germinativum consisting of a single row of regular columnar cells. The true skin or derma consists of an outer or papillary layer containing nerve endings and capillaries, and a deeper reticular layer largely made up of fibrous bundles. Beneath the skin is the subcutaneous connective tissue consisting of oblique elastic fibers and containing lymphatics, vessels, nerves and generally fat. Anal pruritus produces definite typical histopathologic changes in the skin. The first change consists of dilation of the superficial lymphatic and blood vessels in the papillary body and upper portions of the cutis. There is also a mild degree of perivascular infiltration of polymorphonuclear leukocytes and lymphocytes. There is definite acanthosis or lichenification which represent thickening of the prickle cell layer. There is a gradual increase in connective tissue throughout the cutis, with resultant fibrosis. It would appear from clinical experience that the pathologic changes occurring in the skin are irreversible; and since these changes occur particularly in the deeper layer of the skin, any treatment short of removal of the skin would seem to be inadequate.

This report is based on a series of seventy-five consecutive patients suffering from idiopathic pruritus ani who submitted to definitive surgery. These patients were selected from a large group of patients with anal pruritus. In addition to meeting the general requirements for surgery these patients had skin changes limited to the immediate perianal region. It is obvious that surgery would not be feasible in certain widely disseminated lesions. The observations are summarized in Table 1. It should be noted that 90.6 per cent of these patients had associated anorectal pathologic conditions. Seventy-two per cent of the patients were males and 28 per cent were females. Only 14.7 per cent had previous surgery. The average age was forty-four years. All of these patients had excision of practically all of the skin of the perianal region in two stages. They were followed up from two to five years, the average being three years. No evidence of recurrence of the itching or any unpleasant symptoms were noted by 61.3 per cent of the patients. Thirty-six per cent had only slight recurrence of the itching with no other unpleasant symptoms; 2.6 per cent of the patients had 100 per cent recurrence of the itching but no other unpleasant symptoms. One patient representing 1.3 per cent of the cases complained of an unpleasant seepage at the anus making it difficult for him to keep the area clean.

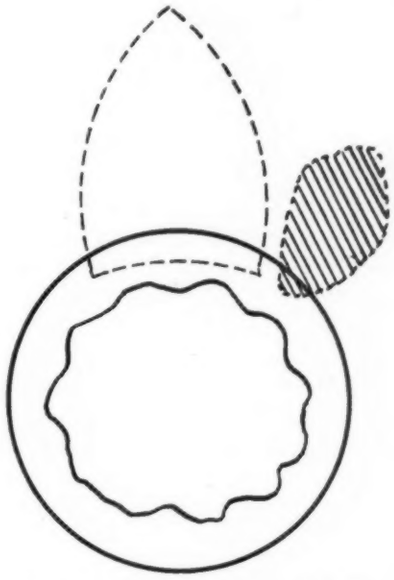

FIG. 1. This diagram indicates method of excision of pruritic skin.

## CONCLUSIONS

The following conclusions on the basis of the present investigation may be made: Surgery has a definite place in the treatment of selected cases of idiopathic pruritus ani. Multiple stage procedure in the removal of all or practically all the involved skin eliminates the unpleasant symptoms due to scar formation. It permits proper epithelization as proven by microscopic study. The results in seventy-five cases are encouraging.

TABLE 1
OBSERVATION ON 75 CONSECUTIVE CASES OF IDIOPATHIC PRURITUS ANI SUBJECTED TO DEFINITIVE SURGERY

| | Years | No. of Cases | Per cent |
|---|---|---|---|
| Average age | 44 | .. | .... |
| Male | .. | 54 | 72 |
| Female | .. | 21 | 28 |
| Associated anorectal condition | .. | 68 | 90.6 |
| Without other anorectal condition | .. | 7 | 9.4 |
| Previous surgery | .. | 11 | 14.7 |
| Without previous surgery | .. | 64 | 85.3 |
| Follow-up | | | |
| Average number of years followed up | 3 | .. | .... |
| No recurrence | .. | 46 | 61.3 |
| Slight recurrence | .. | 27 | 36 |
| Complete recurrence | .. | 2 | 2.6 |
| Unpleasant side effects (seepage) | .. | 1 | 1.3 |

## DISCUSSION

LEONARD J. SCHWADE (Milwaukee, Wis.): The surgical treatment of pruritis ani as the treatment of necessity rather than of choice often gives gratifying results when all other types of treatment have failed. In this brief but very well planned report the author has apparently chosen his cases well. He reports a total of seventy-five cases chosen specifically for their poor response to multiple and various types of treatment known to both general practitioners and specialists. I agree with the author that in such cases surgical intervention is definitely necessary.

The so-called "clover-leaf" operation as described by Dr. Kallet has been tried by me with some modification in technic, with good results in about eighteen cases. These patients had run the gamut of treatment for pruritus ani with little or no relief or had had recurrences of the condition. I found it necessary to keep the patients in the hospital for approximately five to six days, after which time I saw them in my office every other day for eight to twelve times. They were then observed for healing, the anus dilated and excessive granulation tissue removed to assure good and proper epithelization. Having followed up these cases over a period of six months to five years I have found excellent results, with only two or three patients requiring attention and local treatment for very minor recurrences.

In Dr. Kratzer's report the operation is performed in two or more steps requiring the return of the patient to the hospital, or as Dr. Kratzer states, office technic may be completely satisfactory. A contention of dispute in this phase of the operation is that if the strips of pruritic skin are allowed to remain after the removal of the major elliptical portions of skin, what is to prevent the entire cycle from recurring again and the old trouble coming back as badly as before? The criticism of double expense and layoff from work may be presented by some men with regard to the multiple stage method just described. However, in all fairness it must be admitted that the patient with intractable pruritus ani is willing to take the time off and stand the expense if it gives him the much sought after relief.

I would like to ask Dr. Kratzer if he removes the elliptical portions of skin in the same areas on each patient or if he varies the technic for each case? Also, does he not believe that undercutting of the remaining strips of skin would do as well in destroying the pruritus and thus prevent the necessity of the patient returning in the future for the second stage?

Elaborating somewhat on the histopathology of the anal crypts and papillae when discussing the histopathology of the skin of the anal and perianal region is important, as I believe these play a very significant part in the development of pruritus ani. The anal crypts and papillae should be removed at the time of operation. The classical dissertation by Tucker and Hellwig entitled "Histopathology of Anal Crypts" gives an excellent picture of the close association of the crypts and papillae in the development of sensation, pressure, pain and infection. These symptoms are due to the myelinated nerves found in the anal papillae which end in Meissner's tactile corpuscles and

produce the sensitivity of these papillae. I believe that each crypt or papilla should be used as an apex for each elliptical excision of pruritic skin thus forming a definite pattern to follow in the operative procedure.

Hygiene, cleanliness, abstinence from spices, condiments and food containing seeds, etc., are very important in the aftercare of these patients and is important enough to be brought out at this time. Anal stricture is probably the most difficult complication to prevent, but with diligent after care and dilatation this can be prevented.

I am sure that if we were to question every one of our members here today each would have his own pet theory and treatment of this condition and each one would undoubtedly be correct. However, it is the results that count in the long run and not so much the type of treatment advocated.

Dr. Kratzer has chosen a subject that is indeed one of great controversy since the advent of symptoms and diagnosis in this disease. He must be complimented for his fortitude in tackling such an adverse subject. He is to be congratulated for trying a new surgical technic or even a modification of an established technic. This is a step in the right direction since it arouses curiosity and ingenuity in attempting to discover some method for alleviation of discomfort in old controversial condition.

Donald J. Pearson (Battle Creek, Mich.): I enjoyed Dr. Kratzer's remarks. He states one of the reasons for his multiple operative procedure is the formation of scar tissue. Recently there has been a product which has had a lot of research work called kutapressin. It is a derivative which they consider the skin factor of liver, and they have used it in causing keloid formation to disappear. The injection of this at routine intervals causes the large keloids to begin to drop away and the skin to become very soft. I was wondering possibly if the use of some product like this at the time of surgery might not bring about the fact that they could do a more radical job at that time without the fear of excessive scarring. They believe that if kutapressin is used at the time of surgery, you will not form scar tissue but will get good soft healing epithelium.

Laurence G. Bodkin (Brooklyn, N. Y.): I wondered if in the healing of these wounds that the doctor describes as being rather hard and fibrotic it would be tied up with an irritant running down over the new flesh and causing this protein precipitation. Not to hammer too long on one idea, I wonder if you could protect the new healing skin with something of an amino acid nature and possibly have a smoother wound. Naturally, since I have been doing the research on this other material (this covers 200 cases in a recent two years), I have not resorted to surgery. However, I can see where in some of the very severe cases that did not respond to local treatment surgery would be excellent. I thought the doctor's description of it was fine.

Guy L. Kratzer (closing): I want to thank all the discussers and will try to answer some of the questions which they posed for me.

With reference to undercutting the strips of skin, I would say that such procedure produces only temporary relief, and in a matter of a month or two the patients have just as much itching as before. I do think it affords temporary relief, however.

As far as individualization of the patients is concerned, I think that is a very good point. These quadrants can be arranged according to the necessity of each particular case, not necessarily according to the diagram shown.

Dr. Tucker has always advocated removal of the crypts with reference to the treatment of pruritus ani. I think theoretically that is a good point. Actually, in these particular cases I have not removed the crypts unless there was some obvious evidence of cryptitis or enlarged papillae.

Anal strictures have not been a problem because of the multiple stage procedure and also because whenever possible the operation is conducted distal to the dentate line.

Dr. Pearson brings up the point of preventing keloid. I think that would be a boon to surgery in general if we had an agent that we could inject and prevent scar formation, particularly after anorectal and plastic surgery.

With reference to excretions from the bowel irritating the operative site and delaying healing, that has not been a problem in the healing of these patients. I always try to have the patient maintain solid stools and prevent diarrhea.

# STREPTOMYCIN IN THE TREATMENT OF ANORECTAL TUBERCULOSIS*

## WITH PARTICULAR REFERENCE TO TOPICAL THERAPY

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IN spite of recent advances in the surgical treatment of anorectal tuberculosis results still leave room for improvement. The ideal treatment, complete eradication, is not always attained either because the infective process is too extensive for extirpation or because burrowing extensions, too fine to be seen, are inadvertently left behind. As a consequence, some postoperative wounds never heal or recur after apparent healing. However, even in those cases in which healing is real and evidently permanent (these comprise the great majority) this process is usually delayed to a considerable degree.

With the advent of streptomycin and the discovery of its unique ability to inhibit the growth of tubercle bacilli[1] it was natural to turn to this antibiotic for any possible aid it might offer in the care of this troublesome condition.

Streptomycin was at first employed only in our most recalcitrant cases. Soon, however, because the immediate results seemed promising and the scarcity of the drug eased, it was decided to use this antibiotic routinely.

Since we had access to but a very limited supply of the drug at the time (December, 1946), we began with topical applications. Although aware of reports of cutaneous reactions[2] we saw advantages in topical therapy that outweighed this possibility. By this route the drug would reach the site of infection in far greater concentration than it possibly could through intramuscular injections, especially in view of the avascularity of tuberculous lesions. Even the more resistant strains of bacteria would be affected quickly. Consequently, there would be less likelihood of the development of streptomycin-resistant strains. Furthermore, the higher concentration would compensate for the inhibiting effect of any acidity that might be present in the local lesion.[3]

The topical use of streptomycin seemed favored, in addition, by its relative stability in solution,[3] its ability to act rapidly even in the presence of blood,[4] serum or pus[5] and its relatively low degree of irritation.[4]

A survey of the literature available at the outset of this study revealed few instances of the topical use of streptomycin.[6–8,11–14] However, no report could be found of the use of this drug in anorectal tuberculosis as such either by topical applications or intramuscular injections.

### MATERIAL

The period covered by this report extends from December, 1946, through November, 1949. During this time thirty-three operations for fistula, ulcer, or abscess were performed upon twenty-nine male patients with moderate to severe pulmonary tuberculosis at the Kingston Avenue Hospital for Contagious Diseases. We have excluded from this group nine patients whose lesions were both clinically and histologically non-tuberculous or who could not be observed for a sufficient length of time. We have added one patient upon whom no operation was performed.

In sixteen of these twenty-one patients the lesions were proved tuberculous through histologic studies. In Case XIV tissue examination failed to show typical tuberculosis and in Cases 9, 11, 12 and 18 no tissue was removed for examination. Nevertheless, all these lesions appeared clinically to be tuberculous.

### METHOD OF ADMINISTRATION

Streptomycin was first employed as an ointment (33,000 units per gm.). In October, 1947, this was abandoned in favor of an emulsion in cod liver oil (2,000 units per cc.) usually applied on gauze packing. In November, 1948, we changed to a saline solution in the same concentration. This was used for irrigation or to saturate gauze packing. Patients were seen

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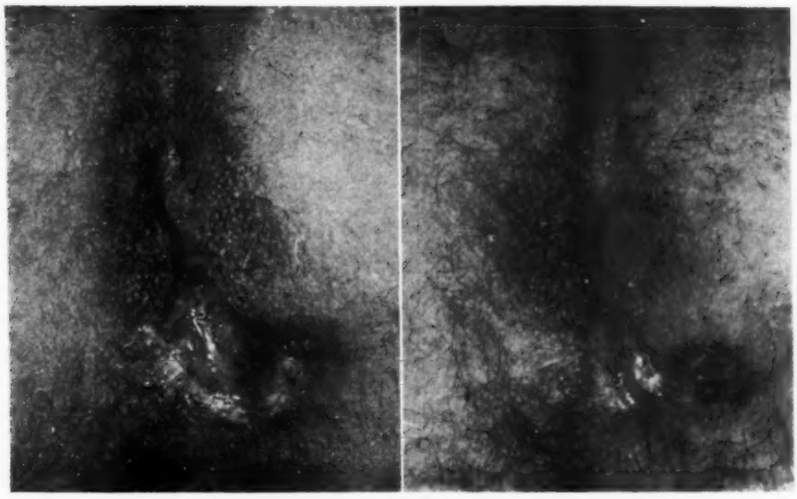

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FIG. 1. Case II. Three weeks postoperatively.
FIG. 2. Same case. Eight weeks postoperatively; three weeks after start of ointment applications.

by members of the proctologic staff usually about once a week, all applications in the interim being necessarily left to the resident staff. Admittedly, it was often impossible for several reasons to assure the regularity of the applications. Intramuscular administration was frequently utilized during the latter part of this study as the antibiotic became more readily available, but always incidentally at the behest of the medical staff based upon consideration of the status of the pulmonary lesion alone.

### CASE REPORTS

CASE I. (E. H., No. 24150.) Five months following the unroofing of a burrowing perianal abscess the edges of the wound continued to be undermined. Granulations were typically edematous, bluish and pale. However, after a few days of streptomycin ointment applications healthy granulations appeared. Improvement progressed to complete healing three months after the start of therapy.

CASE II. (J. S., No. 29736.) Granulations were still boggy and edematous five weeks after excision of an anal ulcer and fistula. At this time streptomycin ointment was started. There was prompt improvement progressing to closure of the wound seven weeks later. (Figs. 1 and 2.)

CASE III. (G. S., No. 20640.) A complex deep fistula was excised except for its deeper ramifications which were curetted and phenolized. Applications of streptomycin ointment were started a week later. The wound filled with healthy granulations and closed nine weeks postoperatively.

Unfortunately ointment applications did not consistently produce such favorable results as is shown by the following:

CASE IV. (J. P., No. 29029.) Two months following the excision of an anal ulcer the wound was stagnant. Streptomycin ointment applications were then started. Renewed activity became evident with firm, pink granulations. Three months later, however, when the wound seemed almost healed, a button hole connection with an abscess was found. This abscess was excised. The wound remained sluggish for six months. Under treatment with the emulsion, however, healing was complete in twelve weeks.

CASE V. (J. K., No. 29170.) No progress being shown for seven weeks following the excision of two fistulas, we turned to streptomycin ointment. Five months later with the wound nearly closed pocketing was discovered. An abscess with burrowing to the supralevator space was saucerized and curetted. The wound was packed with gauze saturated with streptomycin emulsion. The intramuscular administration of this antibiotic was started simultaneously. Healthy granulations filled the wound. It healed ten weeks following the second operation.

In these two cases the ointment evidently failed to penetrate the depths of the wounds or to liberate the drug in sufficient concentration.

The emulsion in Case IV and the emulsion and intramuscular injections of streptomycin in Case V seemed more efficacious. The following cases, too, would seem to point to the potency of streptomycin in emulsion form:

CASE VI. (W. O'D., No. 35555.) Following the excision of a fistula and hemorrhoids the wounds were packed daily with gauze saturated with streptomycin emulsion. They filled with healthy granulations and healed completely in twelve weeks.

CASE VII. (A. T., No. 31141.) A perianal abscess was incised and saucerized. Three months later the edges were found to be undermined. There was a tendency toward pocketing. After a week of daily applications of streptomycin emulsion the discharge and pocketing stopped. The wound proceeded to contract, healing in seven weeks. One year later there was no evidence of recurrence.

That streptomycin tends to limit or localize tuberculous infections seemed to be shown by the following:

CASE VIII. (W. B., No. 36364.) A perianal abscess was incised and irrigated daily with streptomycin solution. Eight weeks later the resulting fistula, now very much contracted (rather an unusual phenomenon for a tuberculous fistula), was excised. The wound was irrigated daily with the same solution. There was complete healing ten weeks postoperatively. Re-examination fourteen months later showed no recurrence.

CASE IX. (J. P., No. 36474.) A perianal abscess was incised and irrigated daily with streptomycin solution. The abscess contracted rapidly, the wound shrinking after sixteen weeks to a tiny opening which led to a short, indurated, non-discharging tract.

CASE X. (H. S., No. 36407.) A multilocular perianal abscess was incised and counterdrained. Twelve days postoperatively intramuscular streptomycin was started and nine days later applications of the solution. When last seen fourteen weeks later the cavity had shrunk to a hard, narrow, fistulous tract in spite of the continued deterioration in the patient's general condition.

With the use of streptomycin we found that it was possible at times to obtain clinical cure after minor surgical procedures. From seventeen years' experience we believe that such operations would ordinarily have been inadequate.

CASE XI. (F. R., No. 30929.) An anal ulcer with undermined edges and sentinel pile had been present six months. Because the patient's precarious condition precluded surgery, streptomycin applications were begun. Fair improvement followed. Eight weeks later the sentinel pile was excised under local anesthesia. The lesion showed progressive healing during the following two weeks. At this point the intramuscular administration of streptomycin was added (for the pulmonary condition). The healing process was perceptibly accelerated, proceeding to completion eleven weeks after excision of the sentinel pile and nine weeks after the start of the intramuscular injections.

CASE XII. This patient, A. B., had a perianal abscess which was incised. The wound was packed daily with gauze impregnated with streptomycin solution. The cavity fibrosed becoming a small non-discharging tract in six weeks. At this time intramuscular streptomycin was begun by the medical service. The wound closed entirely twelve days later.

In the following three cases in which the tuberculous lesions were deep-seated and not as accessible to local therapy the addition of intramuscular streptomycin had a decisive effect:

CASE XIII. (E. D., No. 31208.) A complex anal fistula was partially excised and two branching sinuses in the deep perineal pouch were curetted and phenolized. Seven weeks postoperatively daily applications of the emulsion were begun. The wound shrank slowly. Three months later intramuscular administration was started by the medical service. Healing was accelerated and reached completion in twelve weeks.

CASE XIV. (W. B., No. 23571.) Eleven weeks postoperatively a deep pocket was uncovered in a fistulectomy wound. The abscess was unroofed and packed with gauze saturated with the emulsion. At the end of ten weeks, with partial healing, the intramuscular administration was started. There was total healing eight weeks later.

CASE XV. (J. C., No. 23149.) A deep multilocular abscess was partially excised, the remaining pockets being phenolized and packed with gauze saturated with the emulsion. This was replaced at irregular intervals. Five months later, with the condition of the wound unchanged for several weeks, intramuscular streptomycin was begun. Within ten days granulations took on a healthy appearance. The wound was healed eleven weeks later.

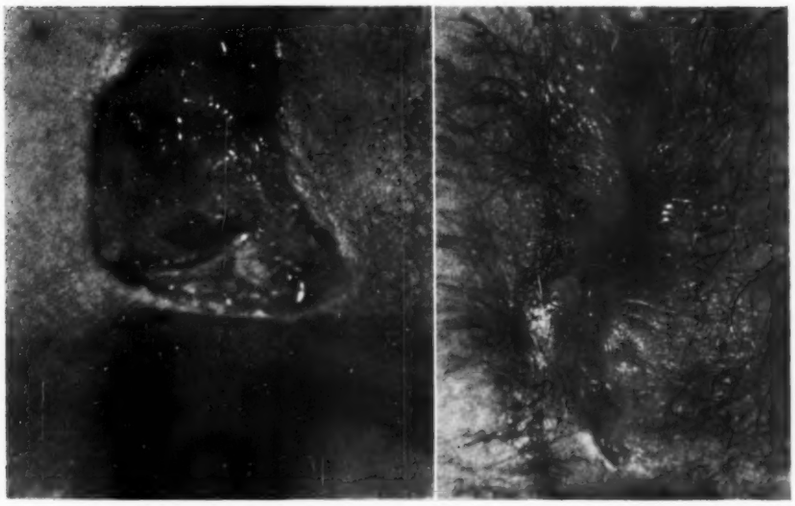

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FIG. 3 Case XXI. One day postoperatively.
FIG. 4. Same case. Four weeks postoperatively; four weeks after start of streptomycin suspension applications. (Topical treatment discontinued a few days later because of perianal rash.)

On the other hand, topical applications seemed to be a valuable complement to the intramuscular route in the following case:

CASE XVI. (W. R., No. 35240.) A fistula and ulcer were excised ten days after the start of intramuscular streptomycin. Four days later the wound nevertheless appeared foul and unhealthy, and applications of streptomycin solution were begun. After five days the wound was clean. The cavity thereafter filled rapidly and was completely healed three months after the operation.

In some of our cases there was improvement locally under streptomycin therapy in spite of the continued deterioration in the general condition. This point is illustrated by Case X as well as the following:

CASE XVII. (C. W., No. 32165.) A bilateral, extensive, perianal fistula was unroofed in a patient too ill to stand the indicated surgery. The wound was packed with gauze saturated with the emulsion. There was progressive healing over a period of weeks despite the patient's continued rapid downhill course.

CASE XVIII. (J. L. No. 32091.) No operation was performed on this patient because of his poor health. Streptomycin emulsion was applied daily to a serpiginous perianal ulcer. After ten days there was marked improvement in the local condition. His general condition, however, continued to deteriorate.

In Cases XIX (W. H., No. 24992), XX (C. H., No. 35556) and XXI (P. M., No. 35727) topical streptomycin was discontinued after twenty-one, one and five weeks, respectively, because of the development of an itchy, reddish, punctate, perianal rash. Intramuscular streptomycin subsequently was well tolerated by these patients. (Figs. 3 and 4.)

## COMMENTS

Since this study was started there has been a progressive accumulation of evidence pointing to the efficacy of streptomycin in the treatment of tuberculous sinuses, including occasional perianal sinuses.[15–17] Up to June, 1950, only one report could be found in which results with anorectal lesions were analyzed as a separate group. Koontz[18] describes his experiences with intramuscular streptomycin in twenty-seven patients with anorectal tuberculosis, mostly following surgery. He claimed healing in 100 per cent. Streptomycin therapy, he believed, shortened the healing time and in some cases made healing possible after surgical procedures of lesser extent than would ordinarily have been necessary.

Kemp[19] relates that five days after extensive débridement of a tuberculous perianal fistula and the institution of intramuscular streptomycin the denuded area was covered with skin grafts. "Final cure" was obtained nine days later.

As for topical treatment of tuberculous le-

sions, good results are reported in pleurisy[20] and in lesions of the chest wall.[21]

Grace and Bryson[22] obtained a cure of a chest wall sinus by the repeated instillacion of a zephiran solution containing streptomycin and penicillin. Use of a solution of reduced surface tension offers, in their opinion the advantages of enhanced penetration.

Only one reference could be found on the subject of topical treatment of perianal lesions. Taubenhaus[23] applied streptomycin solution by dropper several times daily to a fistulectomy wound. Healing was complete in one month.

## SUMMARY AND CONCLUSIONS

In any attempt to interpret our results objectively we encounter obstacles in numerous variables: the virulence of a particular strain of organism, its sensitivity to streptomycin, the resistance of a particular host, bacterial contaminants, the degree of dilution by variable quantity of discharges, the location, configuration and extent of the lesion, the type of surgery performed and, finally, the unevenness of the human element in the application of treatment. Obviously then a statistical evaluation of our therapeutic results would be meaningless. However, certain impressions can be drawn:

1. Under streptomycin therapy wounds stagnant for many weeks promptly assumed new activity. Burrowing was arrested whereas fibrosis and vascularity were stimulated, and epithelization and healing generally accelerated.

2. The intramuscular route seems the most dependable because it offers ease and regularity of administration and the certainty of absorption and of systemic effect.

3. Topical streptomycin treatment is a valuable adjuvant through its powerful local effect. It is most effective in an aqueous medium. To avoid sensitization, which occurred in three (14 per cent) of our cases, it seems advisable to discontinue local applications after two or three weeks.

4. Although favorable results were obtained under streptomycin therapy following minimal procedures, adequate surgery remains the basic treatment.

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DISCUSSION

Clement L. Martin (Chicago, Ill.): Commendable as is the time-consuming and careful work of my colleagues, their findings and conclusions are not confirmed by others.

I have not used streptomycin or dihydrostreptomycin topically in my cases at the City of Chicago Municipal Tuberculous Sanitarium but it has been used in a number of cases with which I am in contact as a consultant at the U. S. Veterans Hospital at Hines, Illinois. Through the Streptomycin Therapy Committee of the Veterans Administration the investigation at Hines Hospital was integrated with similar studies throughout the whole service in the United States. These studies were started in 1949 and are published under the title "Conferences of Streptomycin Committees."

After a year and a half the Veterans Administration abandoned the topical application of these antibiotics. Their use was discontinued because it was definitely determined that local application, whether in an aqueous or oil solution, powder or ointment, was of little or no value whereas intramuscular injection was of great value. In anorectal fistula intramuscular therapy is very beneficial.

Let me enumerate some cases: In empyema topical use was of no value whereas intramuscular injections were of great help. This was true also of tuberculosis of the tongue and the bronchi. Of three patients with tuberculosis of the tongue given topical streptomycin for one month one had no improvement, but subsequent intramuscular injections for one month resulted in cure. The second case, unimproved by local application, had progressive relief after the third day of intramuscular injections. The third patient, who had had two previous vigorous fulgurations, had but little improvement from any medication. Streptomycin in aerosol sprayed on the lesion in laryngeal tuberculosis gave little if any improvement. Insufflation in bronchial sinuses or fistula had little if any effect. There is slight reason to think that better results would be had in anorectal sinuses or fistulas than in the foregoing cases.

The current therapy in tuberculosis, para-aminosalicylic acid with dihydrostreptomycin, has been used for some time. One of three therapeutic procedures determined by the investigator in the individual case is prescribed: (1) 1.0 gm. dihydrostreptomycin intramuscularly a day for two, four, eight or twelve months, and 12 gm. of P. A. S. (para-aminosalicylic acid) daily as indicated; (2) 1.0 gm. twice weekly to once daily intramuscularly, and 12 gm. P. A. S. (para-aminosalicylic acid) every day for the same period; (3) 0.5 gm. intramuscularly daily, and 12 gm. P. A. S. (para-aminosalicylic acid) daily.

This therapy has proved its value; it is the consensus of the staff at both hospitals that local application has little if any effect.

Emil Granet (New York, N. Y.): I must dissent with Dr. Skir and his colleagues on the surgical management of some of the cases that he showed. I grant you that in the deep-seated fistulas, those running up into the supralevator space, it is impossible to excise the lesion. In the superficial types of chronic tuberculous abscesses, some of which he showed, it has been our policy for many years to excise the lesion. This can be readily accomplished because the lesion is superficial. Most of these lesions follow the lymphatics which in that area, as you know, are superficial. We know that tuberculous granulation tissue contains tubercles which can be spread laterally. Therefore, in managing these superficial chronic indurated tuberculous abscesses, instead of unroofing them I think it would be a better procedure when possible to excise the lesion.

Isaac Skir (closing): Dr. Martin has been very kind in his criticism. This criticism is appreciated because I realize he has had extensive experience with anorectal tuberculosis. However, as concerns topical streptomycin therapy, we are simply offering our personal experience as we see it, for what it is worth. You may agree or disagree with our conclusions but these are our findings.

We do not advocate topical therapy except as an adjuvant to intramuscular treatment with streptomycin. We know it does some good. We three have watched the effect of topical treatment month after month. We noted changes in the appearance of the lesions, some of which we tried to point out. There is corroboration of our observations in the innumerable articles about topical streptomycin therapy

in all parts of the body (trachea, larynx, peritoneum, chest wall, etc.) during the past four years. In the August 1950 issue of the *Southern Surgeon* Hoover points to dramatic results due to local use of streptomycin in conjunction with surgical drainage of psoas abscesses. Meleney ascribes great value to topical applications.

Because tubercular lesions are avascular, the drug when introduced intramuscularly is not likely to reach the center of the lesion in high concentration. While local therapy cannot do much harm, it can very often be of help.

Regarding Dr. Granet's remark about excision, we are for wide excision wherever possible. In one of our cases there had been only unroofing because the patient was too ill to stand excision of the very widespread lesion.

# PROPHYLACTIC OOPHORECTOMY WITH RESECTION OF THE LARGE BOWEL FOR CANCER*

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IN this article the frequency of involvement of the ovaries secondary to carcinoma of the large bowel, its serious prognosis and the necessity of careful palpation and inspection of the ovaries at the time of resection of the bowel are emphasized. Further, the advisability of prophylactic oophorectomy in all patients is considered, particularly those over forty years of age in whom a segment of bowel is resected for carcinoma.

There are numerous reports relating to primary carcinoma of the ovary but there is relatively little to be found concerning carcinoma of the ovary secondary to that of the large bowel.

Winge[4] reported eleven carcinomas of the ovary secondary to gastrointestinal cancers which were seen in the Pathology Institute of the Bispebjerg Hospital, Copenhagen, Denmark, in the period from 1937 to 1943, only one of which was a typical Krukenberg tumor. He pointed out that the term Krukenberg should be reserved for tumors which contain a great number of signet ring cells, but that the demarcation is vague. He described the structure and incidence of the secondary carcinomas of the ovary which occur in cases of primary tumors of the gastrointestinal tract and bile passages.

Taylor and Greeley[3] reviewed a series of 138 ovarian cancers, including eighty-eight adenocarcinomas, twelve of which by histologic study might have originated in the stomach or large intestine.

Der Brucke[1] reported a patient of twenty-three in whom carcinoma of the sigmoid involved the left tube and ovary which complicated a seven and a half months pregnancy.

During the fourteen-year period from 1936 to 1949, 493 cancers of the rectum and colon were resected in female patients at the Presbyterian Hospital. Among these were seventeen secondary cancers of the ovary removed either at the first resection of the bowel for cancer or at later varying intervals. This makes an incidence of seventeen in 493 resections or 3.44 per cent. One additional private case of the author's is added from St. Clare's Hospital, New York, so that the analysis includes eighteen cases of ovarian cancer secondary to cancer of the large bowel.

The location of the cancers of the bowel in these eighteen cases was two in the ascending colon, one each in the hepatic flexure, transverse and descending colon, nine in the sigmoid, two each in the rectum and rectosigmoid. From this it will be apparent that at least five of the bowel cancers were at considerable distance from the ovaries. Three others were at a moderate distance in the upper sigmoid.

Thirteen of the ovarian cancers were thought to be separate and distinct from the bowel carcinoma and, therefore, metastatic from the bowel to the ovary. In all thirteen this was the only metastasis found at operation. Three were direct extensions from the bowel to the ovary. One presented multiple carcinomatous deposits in the ovaries, tubes and peritoneum at the primary operation while another showed generalized carcinomatosis at a second operation seven months after the first bowel resection.

There were ten bilateral oophorectomies three of which showed carcinoma in both ovaries secondary to cancers of the hepatic flexure, mid and lower sigmoid.

In six cases the ovary or ovaries were removed at the primary bowel resection, with bilateral oophorectomies in all but one.

Oophorectomy was done later in the other twelve. The interval between intestinal resection and oophorectomy in these twelve varied from three and a half to twenty-two months, with an average of almost ten months.

One patient is living and well. One died suddenly of a heart attack thirteen months after

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the intestinal resection and there were two postoperative deaths. In the other fourteen patients who died of recurrence the period between primary intestinal resection and death varied from six and a half to forty-four months, with an average of eighteen and a half months. In these fourteen the interval between oophorectomy and death was from three and a half to twenty-nine and a half months, with an average of 10.9 months.

*Postoperative Mortality.* In March, 1942, a fifty-two year old patient with an advanced cancer died of shock twenty-four hours after a resection of the rectum, with inversion of the stump, supravaginal hysterectomy and bilateral salpingo-oophorectomy, and another died of general peritonitis and pneumonia on the seventh day after a resection of the sigmoid, bilateral salpingo-oophoretomy and supravaginal hysterectomy in August, 1937.

*Diagnosis.* Secondary cancer of the ovary can be diagnosed in most instances at the original intestinal resection by careful palpation and inspection of the ovaries. This should be a must in every resection of the bowel for cancer. The final diagnosis must depend upon histologic study. It seems likely that there may be frequent instances in which the secondary implants are too small to be recognized grossly. When a solid or cystic tumor of the ovary is found, it is extremely desirable to obtain an immediate frozen section; and if carcinoma is present, appropriate radical surgery must be instituted, as indicated under the section on treatment, provided there is no evidence of other metastases.

There are no early symptoms of cancer of the ovary and the history is of little or no significance in the early detection of this form of cancer. Whether the carcinoma is primary in the ovary or secondary to cancer of the large bowel, the tumor is far advanced in most instances before the patient becomes aware of any symptoms. In several patients these ovarian masses were observed, often by the patient herself, to increase in size rapidly, even reaching almost to the umbilicus in three or four weeks.

*Pathology.* All of the ovarian tumors in this series were adenocarcinomas presenting a histologic structure very similar to that found in cancer of the large bowel. Most of them showed cystic degeneration. The size of these ovarian tumors varied from 1.5 cm. to 23 cm. in their greatest diameter, with an average of 12.6 cm. Eight of them were 15 cm. or more in diameter. One weighed 2¾ pounds and another 3.7 pounds. It has been interesting to note the strikingly large size of these tumors. Some of the larger ones were ruptured or aspirated at operation, and it seems likely that some were much larger than those which reached the laboratory for measurement. This is confirmatory, with the clinical history, of the fact that many of these tumors grew very rapidly and suggests that some of them might have been overlooked at the time of the bowel resection. It seems probable, also, that the occurrence of carcinoma of the ovary secondary to cancer of the bowel has not been sufficiently emphasized to make the surgeon fully conscious of the seriousness and frequency of this site of involvement.

In ten instances in which bilateral oophorectomy was performed three showed carcinoma in both ovaries, two in the left ovary alone, one in the right ovary, two in the left ovary by direct extension and one with both ovaries involved in peritoneal implants (carcinomatosis) and still another in generalized carcinomatosis at the second bowel resection for recurrence.

When a single oophorectomy was done, the right ovary was involved in six cases, the left in two, one of which was by direct extension from a sigmoid tumor.

Among the eighteen cases twelve showed histologic metastatic involvement of the regional lymph nodes, three showed no involvement and there were three instances in which the glandular invasion was not stated. This may indicate either that the spread is primarily through the lymphatic system or that the disease was far advanced when the resections were done.

All of the seventeen cases reported from the Presbyterian Hospital were reviewed by either Drs. Stout, Lattes or Frantz, pathologists at this hospital. Dr. J. R. Ravid, pathologist at St. Clare's Hospital, examined the specimen from the author's other case. All of them agreed that the histologic findings were consistent with secondary involvement of the ovaries following primary carcinoma of the large bowel. Figures 1, 2, 3 and 4 show the histologic structure found in both the ovaries and the large intestine in two representative cases.

*Dissemination of Carcinoma of the Bowel to the Ovary.* The lymphatic and hematogenous systems are generally considered to be the most important means of cancer dissemination, but

FIG. 1. Low power photomicrograph of carcinoma of the large bowel. The tumor is of the mucinous type and large lakes of mucoid material can be seen. Portions of the normal mucosa are still visible. (P. H. Path. No. A-106.)
FIG. 2. Low power photomicrograph of the ovary of the same patient as in Figure 1. On the peritoneal surface of the ovary there is a deposit of neoplastic tissue showing the same mucinous features as those observed in the tumor of the intestine. (P. H. Path. No. A-106.)

there is no rational explanation or concrete evidence to explain how the cells pass from the retroperitoneal lymphatics or from the vessels of the large bowel to the ovaries. One might assume that through some unexplained manner retrograde spread might possibly take place. Dissemination by direct extension from the adjacent bowel tumor to the ovary, of course, requires no speculation.

The explanation which seems most reasonable and that accepted by most writers and now supported by many pathologists is that of direct implantation. This presupposes the release of carcinoma cells from the surface of the large bowel tumor. These cells are then dispersed through the peritoneal cavity by the peristaltic movements of the intestines, aided by the peritoneal fluid. Perhaps because the ovaries are more susceptible to these implants or because of some unexplained predilection for these carcinoma cells, the ovaries may be the first organ to manifest the secondary carcinoma. This mode of dissemination also seems to explain most accurately the multiple peri-

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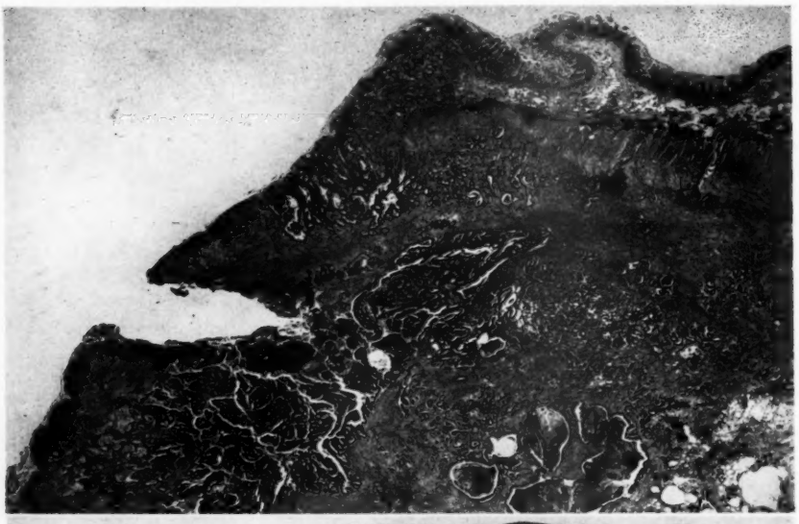

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FIG. 3. Low power photomicrograph of the margin of the ulcerated tumor in the large bowel. It shows the typical pattern of a fairly well differentiated adenocarcinoma which invades all the coats of the intestine as well as the subserosal fat. (P. H. Path. No. 81418.)

FIG. 4. Low power photomicrograph of the ovary from the same patient as in Figure 3. Except for a narrow peripheral zone the ovary is replaced by neoplastic tissue of the same histologic type as that shown in the intestinal tumor. (P. H. Path. No. 81418.)

toneal implants frequently observed at operation in both male and female patients showing carcinoma of the gastrointestinal tract.

### TREATMENT

There has been no uniformity in the operative procedures used in dealing with the problem of cancer of the ovaries secondary to cancer of the large bowel. This serves to emphasize the importance of a more thorough consciousness of this problem and the necessity for more complete investigation of the ovaries at the time of resection of the large bowel for cancer and particularly of more radical extirpation of the affected structures when cancer of the ovary is detected, even if only to afford greater palliation.

The operative management of these cases depends upon one's concept of the spread of carcinoma from the bowel to the ovary. Twelve of our fifteen cases, in which glandular involvement was mentioned, showed metastases in the lymph nodes. The fact that all but four of our patients have died with evidence of generalized carcinomatosis of the abdomen suggests the possibility that the ovarian cancer is only an

early manifestation of generalized transperitoneal spread of carcinoma throughout the abdomen. On the other hand, if one believes that there is another mode of spread through the lymphatics or blood stream by which the ovaries alone are involved secondary to carcinoma of the colon or rectum, one is then justified in doing the most radical resection of the involved or adjacent structures in the absence of other metastatic lesions.

If metastases are blood borne or retrograde through the lymphatics or the result of direct implantation from a source in the colon distant to the ovaries, it seems obvious that oophorectomy and hysterectomy will not remove all of the invaded vascular and lymphatic structures.

One cannot logically draw definite conclusions since the mode of spread to the ovaries is not well understood, the operative procedures have not been standardized and particularly since so few of these cases have been reported.

Until more complete information is available it seems reasonable to extend our concept of more radical extirpation of this form of cancer by resecting widely the affected segment of bowel, doing a bilateral salpingo-oophorectomy in all patients over forty years of age undergoing a bowel resection for carcinoma, and a complete hysterectomy and omentectomy wherever carcinoma of one or both ovaries has been found, provided there are no other demonstrable metastases.

Prophylactic oophorectomy in conjunction with a radical resection of the large bowel for carcinoma seems to be a justifiable procedure. Few women would object to the removal of their ovaries if the danger of spread of carcinoma from the large bowel were discussed with them, particularly since they can be assured of relief from the symptoms of the climacteric by oral and hypodermic estrogens. Speert[2] points out that there is a greater than 1 per cent chance that a woman over forty will die of ovarian cancer, based upon the 1945 vital statistics of the United States. This incidence probably is increased in the presence of cancer of the large bowel.

The ovaries should be carefully inspected prior to a bowel resection for carcinoma; and if a suspicious lesion is encountered, a frozen section should be done. If this is not feasible and the subsequent examination of the tissue reveals carcinoma in either or both ovaries, the appropriate radical surgery should be immediately considered.

Although this adds considerable surgery to the radical bowel resection, with the present day use of blood, good anesthesia and adequate attention to fluid balance and proper preparation of the bowel, the additional risk seems justifiable in an effort to improve the prognosis or more satisfactorily palliate this almost hopeless group of patients.

The conventional type of radiotherapy (200 to 400 kv.) is of doubtful value in treating cancers of the ovary secondary to that in the large bowel, as these tumors, like the primary ones, are notably insensitive to radiation. However, it is believed by the radiotherapists that perhaps the supervoltage (1 million volts or more) might be of more benefit. Three of our patients in this series received conventional radiotherapy, apparently without benefit.

Seventeen of these eighteen patients have been followed up to their death. One patient, who is alive and well for more than five years after the operation, had a resection of the sigmoid and a left oophorectomy for direct extension from the bowel carcinoma. One patient died of shock on the first postoperative day, another of general peritonitis and pneumonia on the seventh day and still another died of a heart attack thirteen months after the bowel resection and one month and eighteen days after oophorectomy. All of the other fourteen died of recurrent or persistent carcinomatosis of the abdomen.

SUMMARY

Among 493 patients with carcinomas of the large bowel operated upon at the Presbyterian Hospital between 1936 and 1949 were seventeen patients with carcinoma of the ovary secondary to cancer of the large bowel, with an incidence of 3.44 per cent. One other private patient of the author's is added.

There were thirteen cases in which the ovary presented the only gross evidence of metastases from the primary bowel tumor. There were three instances of direct extension from the bowel tumor to the ovary. One patient showed bilateral carcinoma of the ovaries with generalized peritoneal implants at the first operation and still another presented a bilateral involvement of the ovaries with generalized carcinomatosis at a second resection of the bowel for recurrence.

Only one patient operated upon at seventy-four for a direct extension of a carcinoma of the sigmoid to the left ovary is alive and well more than five years after the operation. One patient died of shock twenty-four hours after the operation, another of general peritonitis and pneumonia seven days postoperatively, and still another of a heart attack thirteen months after intestinal resection. All the other fourteen patients died with evidence of recurrence.

## CONCLUSIONS

This series is too small to permit the formulation of definite conclusions. With the hope of improving the prognosis in these cases and of at least providing more beneficial palliation, it is suggested that (1) the ovaries be very carefully examined during every laparotomy, particularly for carcinoma of the colon and rectum, and that in the absence of other metastases (2) bilateral oophorectomy be done where feasible in all women over forty years of age undergoing a resection of the bowel for cancer and that (3) bilateral salpingo-oophorectomy and complete hysterectomy be performed, in conjunction with the bowel resection, when a frozen section demonstrates a carcinoma of the ovary.

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## DISCUSSION

J. Edwin Alford (Buffalo, N. Y.): Dr. Burt has given us another warning as to the possibility of metastases or direct extension of malignancy of the large bowel. Some may think that bilateral oophorectomy with or without hysterectomy is too radical a procedure to accompany resection of a portion of the colon with malignancy. Also, many thought Lockhart-Mummary and Miles extremely radical when they first described their operations for the cure of rectal and low-lying sigmoid lesions. It took great perseverance by Rankin, Leahy, Jones, Gabriel and others over many years to convince the surgical world that one-stage resection was the operation that would cure a larger percentage of cases than would local excisions or poorly done Mickulicz-type procedures.

More recently Binkley, Deddish and others have utilized improved lymphatic studies of the pelvis and have become more radical when resecting the low-lying colon or rectal lesion. They stress that the radical procedure should be done at the first operation and not by a Brunschwig operation for recurrent carcinoma. Their recurrence rate supports this thesis.

In 1949 we hear Dr. Appleby describe his operation for cystectomy associated with abdominoperineal resection in cases with direct extension of the rectosigmoid lesion into the base of the bladder and trigone. Many of these cases were previously considered to be inoperable.

I mention these historical facts only to stress Dr. Burt's plea for being more radical when the facts of recurrence are known and not waiting for recurrences in the pelvic structures with the sad picture he paints with only one patient out of eighteen alive five years after having the secondary ovarian cancer removed.

While the mortality rate in this small series of cases is high, I do not believe that bilateral oophorectomy with or without hysterectomy should be an increased hazard to the patient undergoing anterior resection or a combined abdominoperineal procedure.

Our methods of preoperative preparation are good today and have decreased the postoperative mortality and morbidity. Let me stress that they should be followed assiduously and that there should be no compromise with the established principles of preparation before colon resection.

This, coupled with good anesthesia, replacement of blood and protein loss and chemoantibiotic therapy is increasing the operability rate and decreasing the mortality rate in present day large bowel surgery.

E. Parker Hayden (Boston, Mass.): I think Dr. Burt has put just the right amount of emphasis on this problem. I am sure that I have been guilty in the past of not inspecting the ovaries carefully enough when removing the rectum for cancer, being content in many cases with a casual glance which revealed no evidence of a cyst, and then concluding that they were

probably normal. It seems to me that there is no additional risk or disadvantage, in people over forty, in removing the ovaries for pathologic examination. I suppose there may be a possibility also that the elimination of ovarian activity would have some beneficial effect on the cancer as is the case in cancer of the breast. However, I know of no positive evidence of that fact. Certainly the removal of the ovaries is a simple technical procedure without hysterectomy and I have no doubt that Dr. Cattell in his article later will have some figures in that regard which will show that hysterectomy included with abdominoperineal resection is also a relatively safe procedure.

I enjoyed this paper very much and I am sure that as far as I am personally concerned I shall look much more carefully in the future at the ovaries and also palpate them much more carefully.

# TOTAL HYSTERECTOMY WITH RESECTION OF PRIMARY CARCINOMA OF THE BOWEL*

## A REPORT OF FORTY-SEVEN CASES

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IN recent years there has been a definite trend toward a more radical approach to the surgical treatment of carcinoma. This change is particularly applicable to lesions of the colon and rectum. Prior to the adoption of such a policy there were many instances in which these lesions were considered inoperable and some type of palliative procedure was performed. In a twenty-year period in this clinic the operability rate has advanced from 55 to 90 per cent.

For the past few years most surgeons have resected primary lesions of the colon and rectum in the presence of liver or other distant metastases. It has been clearly shown that in the presence of distant metastases this is a justifiable procedure. There is no doubt that when such procedures are carried out, the remaining period of life is more comfortable and the terminal stages of the disease considerably easier. These patients do not have the bloody discharge from a sloughing cancerous lesion and are less likely to have the intractable pelvic pain that individuals with rectal carcinomas usually have in the terminal stages when the lesion is not removed. They usually die from the effects of metastasis to the liver in coma with little or no pain.

To determine the operability of cancer of the rectum or colon, a most essential criterion has been the degree of fixation to surrounding structures. Adherence or direct invasion may lead to the belief that a lesion is inoperable. With the great advances that have been made in anesthesia, chemotherapy, replacement of fluids, sodium and potassium metabolism, surgical technic and preoperative and postoperative care during the past few years, however, this problem has completely changed. From a technical point of view all lesions with rare exceptions can be resected and the decision for or against resection must be made on the possible life expectancy.

In removing a rectal or sigmoid lesion which is adherent or fixed to some surrounding structure several important factors must be considered. It has been thought that adherence of such a lesion to another structure was usually the result of inflammation about the lesion, and actual tumor invasion was probably not present. In such instances one of two procedures was carried out, namely, either the lesion was separated by sharp or blunt dissection from the structure to which it was fixed or some type of side-tracking procedure was performed, hoping that the inflammation would subside, and thus make extirpation of the lesion possible at a later date. This was one of the important reasons why some form of two-stage resection was so frequently used. The fallacy of carrying out either of the aforementioned procedures was clearly demonstrated by Sugarbaker who showed that with the tumor firmly adherent to another structure all layers of the bowel were invaded in 98.2 per cent of the cases and there was actual tumor invasion of the adherent structure in 40 per cent of these cases. It is usually impossible in the operating room to determine the presence of invasion and possible in the pathologic laboratory only after many sections have been examined.

Considering this fact, the importance of resecting adherent structures with the primary tumor is evident and one should not hesitate to carry out such a procedure. Often the spread to the adjacent structure is the only spread present and removal will result in cure. It is recognized that the size of a tumor bears no definite relation to lymphatic spread and hence should not determine operability. Gilchrist and David reported a five-year survival rate in 40 per cent of thirty-five patients with fixation of

* From the Department of Surgery, Lahey Clinic, Boston, Mass. This report is part of a follow-up study of all cases of carcinoma of the colon and rectum aided by a grant from the American Cancer Society, Massachusetts Division.

the tumor to another structure which required resection. Their postoperative mortality was 20 per cent which undoubtedly has improved since their report. Structures resected included the prostate, posterior vaginal wall, uterus, ovaries and small bowel. We have previously reported a survival rate of 37 per cent when local adherence of the tumor was present. Sugarbaker in a more recent report obtained an over-all mortality of 9 per cent when carrying out similar procedures. Thus, it is clearly shown that there must be no compromise in the radicalism of the operative procedure for these lesions if the salvage rate in these patients is to be increased.

During the past twenty years forty-seven panhysterectomies have been performed at the clinic in conjunction with removal of a carcinoma of the low sigmoid, rectosigmoid or rectum. All but five of these operations have been done within the past ten years. In eleven the two-stage Lahey abdominoperineal resection was used. Thirty-four were performed in conjunction with a Miles' single-stage abdominoperineal resection. This is the routine procedure used in our cases today. In one instance an anterior resection with primary anastomosis was used for a lesion in the low sigmoid. In another instance an anterior resection was performed which produced a permanent colostomy but inverted the distal rectal stump. In two patients the operation followed a previous resection of a carcinoma of the rectum and of the sigmoid. One of these patients had a recurrence at the previous perineal colostomy following a pull-through operation. The other patient had previously had an anterior resection for carcinoma of the sigmoid. At operation this patient was found to have a recurrence of the tumor with extension to the uterus and metastases to nodes along the inferior mesenteric artery. In this instance the inferior mesenteric artery was divided at the aorta, making it necessary to perform a left hemicolectomy along with the abdominoperineal resection and total hysterectomy.

The indication for panhysterectomy along with removal of the primary tumor is any adherence or invasion of the pelvic organs. As previously mentioned, it is often impossible to determine in the operating room the exact degree of invasion. Therefore, it is imperative that the primary tumor and its adherent structure be removed with as wide a margin as safety will permit. In those instances in which a low-lying lesion invades the posterior vaginal wall it is difficult to determine whether the cervix or body of the uterus is involved until the specimens are examined in the laboratory. Nevertheless, if the patient's condition permits, total hysterectomy with excision of the posterior vaginal wall and any other involved structure should be performed. If the lesion is low on the anterior wall of the rectum, routine removal of the posterior wall of the vagina and perineum is carried out with or without panhysterectomy, as indicated.

In this series thirty-six of forty-seven patients who had total hysterectomy had definite adherence and fixation of the tumor to the uterus. In eight there was invasion of the upper border of the posterior vaginal wall with questionable involvement of the cervix. Two had involvement of the uterosacral ligament, extending anteriorly to the cervical-uterine junction, and one had metastases to the left ovary. In three of the forty-seven patients there was direct extension of the carcinoma into the small bowel, in addition, which required resection and primary anastomosis.

Of the thirty-six patients in whom there was gross evidence of extension of the tumor to the uterus, active invasion was found on microscopic section in fourteen, or 38.8 per cent. Of the eight patients who had invasion of the vagina with or without questionable involvement of the cervix, seven or 87.5 per cent showed invasion of the vagina and five or 62.5 per cent had actual invasion of the cervix microscopically. The presence of invasive tumor was confirmed microscopically in the two cases with extension into the uterosacral ligament and the single case with extension into the left ovary. It is to be noted that in all forty-seven cases there was involvement of all layers of the bowel wall by the tumor, with extension into the pericolonic or perirectal tissues.

The type of lesions did not vary greatly. In forty-four of the cases adenocarcinomas were present and in one instance two lesions were present. Four of these were of the mucinous type. There were two instances of carcinoma simplex and one of epidermoid carcinoma. In the case of epidermoid carcinoma bilateral dissection of the groin was performed; all nodes were negative. In the total group positive lymph nodes were found in twenty-two or 46.8 per cent; blood vessel invasion was present in

fourteen or 29.7 per cent and metastasis to the liver in six or 12.7 per cent.

There were two postoperative deaths, an incidence of 4 per cent. One patient died three hours after operation from uncontrolled hemorrhage. The other patient died on the twelfth postoperative day as a result of pulmonary embolism. This mortality rate corresponds to that following a single stage abdominoperineal resection without the added total hysterectomy.

One patient had wound evisceration which was successfully resutured. Thrombophlebitis developed in four patients; all were treated with anticoagulants. One of these patients had a non-fatal pulmonary embolus. The patient previously mentioned who died from a pulmonary embolus showed no evidence of thrombophlebitis before death. Obstruction of the small bowel developed in one case on the third postoperative day. Exploratory operation was performed and 3 feet of gangrenous small bowel which was adherent to the pelvic diaphragm was found. The bowel was resected and a primary anastomosis performed. Recovery was prompt and there were no further complications.

The most troublesome complication which occurred was ureteral fistula. Considering the extent of the operation, ureteral injury is a serious hazard. There were three ureteral fistulas and one vesicovaginal fistula. Two of the ureteral fistulas closed without operative intervention. In one instance nephrectomy was necessary. The vesicovaginal fistula was successfully repaired. No fatalities occurred in these cases.

This is a small group of patients from which to determine the follow-up data. Yet a sufficient number has been followed up for five years to indicate what can be accomplished by this procedure. Of the forty-seven patients operated upon there were two operative deaths and four patients were lost to the follow-up. Of the patients operated upon before 1946, ten of 26 or 38.5 per cent were free of recurrence. Twenty of the forty-one patients lived two years or more. Yet from a study of those known dead from recurrence there was clinical evidence of this recurrence during this short two-year period of follow-up. This is an important point in prognosis. In considering the survival rate it must be remembered that six or 12.7 per cent of the entire group had metastases to the liver at the time of resection. Furthermore, these patients presented a more advanced stage of malignancy of the colon and rectum than the routine reports of large series of cases of carcinoma.

## SUMMARY

Carcinoma of the sigmoid and rectum tends to become adherent or invade the uterus and its appendages as well as the vagina in many cases. Under these circumstances the lesion is usually found to involve all coats of the bowel and in approximately 40 per cent of cases in which the bowel is adherent to the uterus, malignant invasion can be demonstrated histologically. When the lesion is contiguous to the vagina, involvement may be as high as 88 per cent. At operation it is impossible to determine whether adherence is due to inflammation or malignancy so that all patients should have the benefit of complete hysterectomy and removal of the posterior vaginal wall.

Complete hysterectomy combined with resection of the bowel is reported in forty-seven cases with two postoperative deaths, a mortality of 4 per cent.

Of the patients followed up five years or more 38 per cent were shown to be free of recurrence.

Resection of structures adherent to carcinoma of the sigmoid and rectum is essential to obtain the greatest salvage rate and is an important means of increasing the number of lesions amenable to resection.

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DISCUSSION

ROBERT A. SCARBOROUGH (San Francisco, Calif.): Dr. Cattell has presented most encouraging statistical data in support of the principle that resection of contiguous organs adherent to primary large bowel carcinomas is feasible, advisable and frequently curative. His report today deals specifically with instances of involvement of the female genital organs. The same principle is applicable when such carcinomas are adherent to many other abdominal organs. We have included in primary resections, at one time or another, all or portions of the spleen, pancreas, stomach, liver, gallbladder, small intestine, ureter, bladder, seminal vesicles, prostate, vagina, uterus, fallopian tubes and abdominal wall.

I should like to reiterate Dr. Cattell's statement that neither the size of a primary carcinoma nor fixation to adjacent resectable organs is evidence of inoperability. Increasing experience has taught me that a large tumor, adherent to and presumably invading some adjacent organ, in the absence of evidence of any distal metastases, is quite likely to be a fairly well differentiated tumor, directly invasive but reluctant to metastasize. In such cases radical resection should be undertaken with reasonable optimism concerning prognosis. This resection should be performed at once. To devise a preliminary proximal colostomy and then expect the conditions of operability to become improved is a fallacious principle and serves only to delay further definitive surgery.

Dr. Cattell calls our attention to the serious hazard of ureteral injury in the type of resection under discussion. When preoperative examination suggests the probability of an extensive lesion, it would seem wise to carry out preliminary bilateral ureteral catheterization and kidney function tests. Indwelling ureteral catheters can facilitate dissection to avoid injury to the ureters and simplify repair of recognized accidental injuries. If one ureter is found to be involved by carcinoma and must be included in the resection, it is justifiable to sacrifice the function of the kidney on that side by proximal ligation of the ureter, provided there is a known satisfactory function of the opposite kidney. This should be done with a non-absorbable ligature. In the absence of intrinsic infection the kidney will atrophy without subsequent symptoms.

CON AMORE V. BURT (New York, N. Y.): I wish to emphasize a point which Dr. Scarborough has just made. That is the desirability of knowing exactly the condition of the kidneys and the ureters insofar as this can be determined preoperatively. This is particularly important when there has been a previous prostatectomy or when kidney damage or involvement of the ureters is suspected. The importance of this was emphasized in an abdominoperineal resection of mine in a patient of eighty-two, who had had a previous prostatectomy. He developed a ureteral fistula through the perineal wound on the tenth day after the abdominoperineal resection. We felt reasonably certain that we had not injured the ureter, but we probably did compromise the blood supply. Otherwise, he would have had a fistula there long before the tenth day. This might have been avoided if ureteral catheters had been in position.

It is our practice also to study thoroughly the kidneys not only with intravenous but also retrograde pyelograms. The ureteral catheters are placed in the ureters in the morning just prior to the operation in all cases with previous prostatectomy or when we anticipate the possibility of trouble. The reason it has to be done in the morning is that if the catheters are placed in at night, the ureters will probably force them into the bladder by the time of operation the next morning.

MONTE EDWARDS (Baltimore, Md.): I am very much interested in Dr. Cattell's subject and Dr. Scarborough's discussion and would like to say something about the technical features of these operations. The combined operative procedure of rectal excision and hysterectomy has one or two points in it that need to be emphasized. One is that peritonization of the pelvic floor may be difficult, and for that reason a considerable mobilization has to be done of the parietal peritoneum. I would warn those who are doing this procedure not to incorporate the peritoneum in the ligation of the various vessels supplying the pelvic viscera. With this precaution they can get a much better mobilization of the peritoneum for a subsequent construction of the pelvic floor.

Another point I would like to bring out is as follows: If there is a high lesion and there is a poor chance of achieving good peritonization, it is in all probability better to do what is called

the Hartmann procedure and not attempt to do any peritonization whatever. I have done two such cases this year, and each has had a very smooth postoperative convalescence.

The third factor that comes to mind is in closure of the perineal wound, after doing rectal excision with removal of any considerable amount of the vagina, drainage should not be attempted through the middle of the perineal incision. The closure of the wound should be made from behind forward and all drainage done through the anterior part of the wound. The ability of the vaginal mucosa to reproduce itself in the cavity that has been made by the procedure precludes the necessity for vaginal reconstruction.

# DIVERTICULOSIS AND DIVERTICULITIS

## GENERAL CONSIDERATION AND SIGMOIDOSCOPIC DIAGNOSIS

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IT is doubtlessly well known to all proctologists that diverticula can occur in any portion of the intestinal tract from the larynx to the anus. Diverticula are classified usually as congenital and acquired or true and false. The congenital or true diverticulum is probably best represented by Meckel's diverticulum and its walls are composed of all of the coats of the bowel in their normal relationship. The acquired or false diverticulum, the type in which we are especially interested, may develop at any time after birth; it is a herniation of mucous membrane between the circular muscle fibers of the colon or in the spaces between the longitudinal muscle bands.

Many theories have been advanced to explain the cause of the acquired diverticulum in the colon. Although most of the theories doubtlessly give some mechanical explanation, the exceptions prevent the acceptance of any single theory. Let me consider some of the suggested etiologic factors. Constipation seems to be a contributory factor; however, diverticula occur more frequently in males than in females and notoriously constipation occurs more frequently in females. Devine[3] stated that straining to evacuate the stool is a contributing factor and that the firm consistency of the feces in that region of the colon in which diverticula occur most frequently is also a factor. Both of these factors are exaggerated in this consideration (1) because the expulsive effort is most marked in the rectum but diverticula occur more frequently in the sigmoid and (2) the fecal material observed in unprepared bowels is firmer in the rectum than the sigmoid. The same author suggested that enemas and harsh cathartics are contributing factors, this obviously is the obverse side of the reasoning which suggested straining and firm stools as causative factors. Another author stated unequivocally that acquired diverticula are pulsion diverticula[5] and are the result of increased pressure in the bowel. This hypothesis fails to explain why diverticula are more common in the latter decades of life in spite of the fact that positive or potentially positive pressure begins in the colon with the child's first cry and his first effort to expel meconium and continues, unless modified by a pathologic or surgical process, until death.

Yeomans[9] collected four possible reasons why diverticula may develop. These seem to present a basis for sound thinking and to permit the variability which stimulates further consideration until the problem is satisfactorily explained. These are as follows: (1) Diverticula are the result of hernial protrusion which follow the emerging veins. This was suggested by Gaeser but denied by Sudsky. (2) Increased intracolonic pressure causes herniation through weak points as a result of irregular contraction (Keith). (3) The most that can be said is that for some cause a weakness exists in the intestinal coats, and by reason of this weakness a pouching of the coats takes place when undue pressure arises (Hartwell and Cecil). (4) Erdman inclined to the view that all are of congenital origin. Each of the factors mentioned may contribute a portion to the etiology of diverticula but probably no single factor will explain all diverticula.

Historically it is interesting to observe that early in the eighteenth century the anatomists were observing and recording the presence of diverticula and that by 1853, 1861, and 1869 the pathologists, Virchow, Rokitansky and Klebs, were contributing more specific information. In the early twentieth century the surgeons, Graser,[4] Beer,[1] Moynihan,[7] Mayo, Wilson, Giffin[6] and others, contributed their observations and suggested treatment. Since then the literature has become voluminous, and recently with the employment of the sulfonamide drugs and antibiotics there has been a greater tendency to urge surgical intervention and cure rather than alleviation and palliation.

Although the problems presented by diverticulosis and diverticulitis are of general interest, the proctologist is especially concerned with

their cause, diagnosis and treatment. At first, as disclosed by a historical review of our knowledge, post-mortem examinations provided us with our only information. Later we were compelled to rely on the patient's history and gross physical examination to try to arrive at the proper diagnosis, but at present we have sigmoidoscopy and rotentgenology which have contributed much to the making of the correct diagnosis and decisions relative to the need of surgical intervention.

### SIGMOIDOSCOPIC CONSIDERATIONS

The place of sigmoidoscopy in the diagnosis of diverticulosis or diverticulitis seemed doubtful earlier in this century but its value has increased as time has passed and experience and knowledge have accumulated. Many men have considered it rare to observe diverticula through a sigmoidoscope but enough affirmative evidence has been gathered so that this attitude can be maintained no longer.

*Diverticulosis.* Twenty-five years ago when I became associated with Dr. L. A. Buie at the Mayo Clinic he showed me sacculations in the sigmoid and stated that these were frequently associated with diverticula. The relationship of sacculations and diverticula has been demonstrated in my own experience and in that of Buie and Jackman[2] who reported statistical data. A sacculus or sacculation is a permanent outward pouching of the wall of the intestine limited above and below by sharply projecting, permanently situated folds of the intestinal wall. The etiologic relationship between sacculations and diverticula is still obscure. That they are not the result of direct inflammatory reaction associated with diverticula or diverticulitis is demonstrated by the fact that they often precede diverticula and furthermore diverticula do not retain any apparent fixed relationship with sacculations. Sacculations always appear above the level of the peritoneal reflection and are present in the rectosigmoid and more frequently in the sigmoid. Their presence increases the difficulty of sigmoidoscopic examination.

Diverticula can be observed grossly. Their presence is often disclosed during sigmoidoscopic examination by displacement of their fecal content as a result of slight pressure from the distal tip of the sigmoidoscope. The orifices of diverticula vary greatly in diameter from several millimeters to 1.5 to 2 cm. I have seen some diverticula which were large enough to engage the end of the sigmoidoscope without difficulty. Only rarely can any degree of symmetry be observed in the location of diverticula. I can recall one instance in an elderly man who was found to have three or four diverticula in each of the sacculations which were present. These diverticula occurred with minimal variations in the deepest part of the sacculation, which were uniform in size.

Bleeding is not a common symptom of diverticulosis but the fact that it does occur is undeniable. On one occasion I was called to make a sigmoidoscopic examination on a rather obese woman as part of our emergency examination. The patient had been admitted to the hospital because she was passing large amounts of blood from the rectum. Sigmoidoscopic examination disclosed that the bleeding was occurring from the inferior margins or orifices of a number of large diverticula. Immobility of the bowel, the usual sign of typical diverticulitis, was not present. The bleeding gradually subsided spontaneously but several transfusions of 500 cc. of whole blood were required to prevent shock or any more serious result. As far as I have been able to discover the bleeding never recurred.

When the likelihood of bleeding from the diverticula is being considered, it is advisable always to eliminate the presence of other lesions, such as polyps or a carcinoma, which also may be present. Such lesions are a more likely source for bleeding and their discovery is of greater importance to the patient. Scarborough[8] mentioned several cases of bleeding from the rectum in which diverticula were present but lesions in the more proximal portion of the bowel than that in which the diverticula were situated had caused the bleeding. Doubtlessly this coincidence can be duplicated rather often.

At the clinic we have observed another interesting but comparatively rare lesion when diverticula are present. Twenty-two years ago Dr. Buie showed me such a lesion and since then we have observed it seven or eight times. At first the lesion resembled a polyp in the sigmoid colon; but when the sigmoidoscope was placed over the lesion and the instrument was inflated slightly, the protruding mucosa could be everted. This lesion then presented the picture of a typical diverticulum. Such a lesion also was observed recently during roentgenologic examination of a patient's colon. It was

thought to be a polyp and surgical excision was advised. When this was accomplished, the pathologist discovered that actually the polyp was a diverticulum which was inverted into the lumen of the bowl. The consequence of too prompt application of fulguration or removal of such a lesion by a snare can be imagined. Although such lesions are rare, it is well to keep the possibility in mind.

*Diverticulitis.* Diverticulitis presents a more complicated diagnostic problem. The picture is not typical; it varies greatly in different patients and also in the same patient on several occasions. Often sigmoidoscopic examination is more difficult to accomplish than usual unless the inflammatory process is above the field examined. The usual mobility of sigmoid colon is limited and instrumentation causes more discomfort than ordinarily. Fortunately, in cases in which the diagnosis is relatively easy to make the proctologist is able to see one or more diverticula which will provide a clue to the pathologic process present. Even then it is difficult or impossible to rule out the presence of the more serious lesion, carcinoma. In many cases in which actual obstruction of the lumen occurs it is impossible by feel or by observation of the appearance to be sure that the pathologic process is inflammatory and not malignant. The presence of edema, a longer history of gradually increasing obstruction, the lack of bleeding and the occurrence of more pain than is usual in the presence of carcinoma may suggest the underlying process. In many instances the diagnosis can be made only by the pathologist after the involved tissue has been resected.

Firm extrarectal masses anterior to the rectum may be caused by diverticulitis if the patient has redundant sigmoid colon. In some instances the rectal or sigmoidal opening of a rectovesical fistula originating in a diverticulum showing diverticulitis may be disclosed during sigmoidoscopic examination but more frequently such openings are higher in the bowel and they cannot be disclosed because of the limitation of the motion of the bowel that is usually present.

The bowel of a woman who has previously undergone abdominal hysterectomy frequently angulates sharply 14 to 16 cm. above the anus. This condition may give the impression that the fixation which occurs in diverticulitis is present or it may prevent satisfactory visualization of the sigmoid colon and the discovery of diverticula or evidence of diverticulitis. Endometriosis, involving the anterior part of the rectal wall secondarily, also may limit the motion of the bowel sufficiently so that complete sigmoidoscopic examination may be difficult or impossible. This condition, however, occurs among young women and does not tend to simulate or mask diverticulosis or diverticulitis to an appreciable degree. Uterine myomas, occurring in older women, frequently will prevent satisfactory examination of the sigmoid colon and may produce a mass that may be mistaken for the inflammatory mass sometimes caused by diverticulitis. Roentgenologic examination will promptly eliminate any doubt that may still exist after sigmoidoscopic examination.

TABLE 1
AGE AND SEX OF PATIENTS GIVEN A DIAGNOSIS OF DIVERTICULOSIS OF THE COLON AT MAYO CLINIC IN 1949 AND 1950

| Age | Total | | Males | | Females | |
|---|---|---|---|---|---|---|
| | No. | Per cent | No. | Per cent | No. | Per cent |
| (yr.) | | | | | | |
| 20–29 | 6 | 0.4 | 3 | 0.4 | 3 | 0.4 |
| 30–39 | 21 | 1.6 | 12 | 1.8 | 9 | 1.3 |
| 40–49 | 166 | 12.4 | 89 | 13.3 | 77 | 11.5 |
| 50–59 | 439 | 32.9 | 213 | 32.0 | 226 | 34.0 |
| 60–69 | 471 | 35.4 | 216 | 32.5 | 255 | 38.3 |
| 70–79 | 207 | 15.5 | 123 | 18.4 | 84 | 12.6 |
| 80–89 | 23 | 1.7 | 11 | 1.6 | 12 | 1.8 |
| 90–99 | 1 | 0.7 | 0 | .... | 1 | 0.1 |
| Total | 1334 | 100 | 667 | 100 | 667 | 100 |
| Mean | 60.5 yr. | | 60.6 yr. | | 60.4 yr. | |

When prompt colostomy has been required because of obstruction of the colon from an unknown cause, subsequently it is possible often to examine the proximal portion of the distal loop to determine the cause of the obstruction. Frequently after the colostomy is accomplished the acute inflammatory process produced by diverticulitis will subside sufficiently so that the cause of the obstruction can be determined accurately at sigmoidoscopic examination even if no clue could be observed at the time of the preoperative sigmoidoscopic examination.

*Mayo Clinic Series.* The ages of patients who have diverticula and diverticulitis have

been recorded in a number of studies and the variability of the appearance of these lesions in both sexes has been estimated similarly. The result of a study of those patients whose condition was diagnosed as colonic diverticula during the years 1949 and 1950 at the Mayo Clinic

TABLE II

PROCTOLOGIC OR OTHER CLUE LEADING TO DIAGNOSIS OF DIVERTICULOSIS OR DIVERTICULITIS: 200 CASES*

| | Cases |
|---|---|
| Rectal bleeding | |
| Negative sigmoidoscopic examination | 5 |
| Angulation of the bowel | 13 |
| Sacculations in the sigmoid colon | 28 |
| Mobility of the sigmoid colon limited | 28 |
| Diverticula observed | 21 |
| Polyp in distal 24 cm. of colon | 25 |
| Extrarectal mass | 4 |
| Intra-abdominal observation during abdominal operation | 7 |
| Carcinoma | 1 |
| Variation of the function of the colon: diarrhea, irritable bowel, constipation, etc | 44 |

* In 24 cases it was a chance finding in roentgenograms of colon.

are given in Table I. The similarity of the distribution in both sexes and the decade of life in which the lesions occur seem too pronounced to require discussion.

Two hundred cases were analyzed also to determine, if possible, the reason for the diagnosis or the clue to the presence of the lesions. (Table II.) In some cases more than one reason or clue was found. In seven cases the surgeon observed diverticula while operating on a patient for some unrelated pathologic process. In forty-four cases the patients had roentgenologic examination of the colon because of some dysfunction of the colon. In some of these forty-four patients a sigmoidoscopic examination had not disclosed the presence of the lesions or any abnormality that might even suggest their presence.

*Relation to Malignant Lesions of Colon.* The relationship of diverticulosis or diverticulitis and malignant lesion has been implied but the theory still lacks confirmation. The fact that both types of lesions are comparatively common in the sigmoid colon would permit the assumption that both lesions will occur coincidentally in the same individual in an almost mathematically predictable number of patients. The cause and effect relationship of diverticulosis or diverticulitis on carcinoma of the colon still lacks conclusive proof.

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# ROENTGENOLOGIC ASPECTS OF DIVERTICULITIS AND ITS COMPLICATIONS

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ONE of the more frequent diseases encountered in the colon by the roentgenologist is diverticulitis. The scope of his methods of study is limited for the most part to diseases above the rectosigmoidal junction. Statistics dealing with frequency, therefore, will vary when compared with those of the proctologist for all diseases but most particularly for diverticulitis, since this disease rarely affects the rectum primarily, and is often above the reach of the sigmoidoscope.

One can gauge the number of patients likely to have diverticulitis from studies of incidence that have been reported. Let us first record the incidence of diverticulosis. Anderson[1] reports that at the Mayo Clinic 5.7 per cent of 31,838 patients having colon studies are found to have diverticulosis. Martin and Adsit[2] report a 5 per cent incidence, Jones[3] a 6 per cent incidence and Bockus[4] states that from 5 to 10 per cent of all persons over forty years of age can be demonstrated to have diverticula. Since these figures represent incidence only in people having barium enema studies, they are probably slightly high.

Many reports indicate that diverticulitis occurs in from 12 to 22 per cent of patients with diverticulosis[3–8] and Graham states that 1 of every 250 people will have diverticulitis. He also stated in 1937 that this is close to the incidence of duodenal ulcer in the general population, but that it has never aroused the interest or amount of discussion that peptic ulcer has prompted.

We will make no effort to review the general pathology or clinical features of the disease. However, since representative cases of diverticulitis and its complications will be demonstrated, it seems pertinent to include a description of factors that may account for the inflammatory changes, especially in the sigmoid. Anderson[1] comments as follows: "The reason for the more frequent occurrence in the sigmoid may be that the right portion of the colon is larger and feces are liquid in this portion, while in the left portion they tend to become solid. When the fecal mass fills the rectum sufficiently to exert a pressure of between 40 and 50 mm. of mercury, defecation occurs. Before defecation the sigmoid bears this pressure, and weakening of the muscular layer which tends to produce diverticula possibly may occur as a consequence. The difference in size of the colon and consistency of the feces may account for the fact that diverticula in the left portion of the colon more frequently contain fecaliths which obstruct drainage. The solidity of the fecal stream, the smaller size of the colon, and in some cases, the presence of a fecalith are predisposing factors in the development of inflammatory changes within the pouch."

The presence or absence of this disease and its differentiation from other conditions can be done best by roentgenologic methods. The five sigmoidoscopic criteria listed by Buie[9] are at best inferential. In assessing the use of the sigmoidoscope in differentiating diverticulitis from cancer, Willard and Bockus[7] consider that most cancers of the left colon can be reached by the sigmoidoscope, because there is rarely sufficient spasm or edema below the growth to prevent visualization. In diverticulitis involving low segments the sigmoidoscope finds the bowel lumen closed by edema and spasm and gives a sensation of fixation without demonstrating a mass.

It is apparent that the roentgenoscope will not be able to establish the presence of the disease in every instance. There will be indeterminate cases, particularly due to obstruction to the retrograde flow of the barium enema, and there will be definite errors. In one small group of cases reported[6] the roentgenologic method was absolutely correct only 57 per cent of the time. Obstruction, in our experience, is the chief reason why the presence of the disease cannot be established. This obstruction is to the retrograde flow of barium and can occur even

FIG. 1. Case 1. Sigmoid diverticulitis with an abscess displacing the colon medially and upward.

though the patient is not clinically obstructed. However, it would be hazardous in these instances to attempt to differentiate spasm from infiltrative disease of the bowel wall by the oral barium meal because of the possibility that a real obstruction might be produced by the barium meal.

Roentgen methods *do* readily establish the absence of diverticulitis and this negative evidence is, therefore, very helpful in differentiating diverticulitis from functional disorders of the colon, a problem which very frequently confronts the clinician. It will also exclude diverticulitis as a cause of left lower quadrant pain, especially of gynecologic or urologic origin.

Although some instances of diverticulitis, with or without complication, are reported in the right colon,[1,10] the great majority of the cases are due to infection of the left colon. Ochsner and Bargen[11] found that in less than 2 per cent of patients with uncomplicated diverticulosis was the lesion in the right portion of the colon.

It follows then that any discussion of the complications of diverticulitis will center about the pelvis and left abdomen.

Our experience is limited to complications in these areas and representative cases illustrating the cardinal examples will be discussed. These are: abscesses, fistulas and obstructions. The problems incident to concurrent bowel carcinoma also will be presented.

### PERIDIVERTICULAR ABSCESSES

Roentgenologically, peridiverticular abscesses are of two types: first, abscesses that are identified by a palpable mass contiguous with the bowel or by their displacement effect on the bowel because of their size and, second, abscesses that are recognizable as such on the roentgenograms because their communication with the lumen of a diverticulum which has perforated is sufficiently large to permit the ingress of the opaque mixture.

CASE 1. (Fig. 1.) E. B., a forty-three year old white female, complained of a weight loss of 72 pounds in the last two years, and dull aching pain in the left lower quadrant. There had been increasing constipation which produced increase in the pain. The ache was aggravated by evacuation. For the five days preceding admission to the hospital, she had had no bowel movements. On admission the findings were a palpable left lower quadrant mass, slightly tender, temperature 101°F., white blood count 8,500 and stools normal.

The roentgen findings were a tender sigmoid loop, slightly attenuated and spastic, displaced medially and upward by a contiguous mass which moved together with the sigmoid on palpation; a transversely puckered bowel margin and diverticula; and the gradual transition at the extremities of the lesion from abnormal to normal appearance.

CASE 11. (Fig. 2.) B. R., a sixty-five year old white female, complained of abdominal pain having been present for fifteen years. There had been alternating periods of constipation and diarrhea for many years. Recently she had lost weight. According to the patient, roentgen examination three years previously had demonstrated an irritable colon and several diverticula. On admission the findings were diffuse abdominal tenderness, a small pararectal mass, 1½ inches above the anus, definitely extraluminal in position, a normal gynecologic survey, temperature 98°F, white blood count normal and stools positive for occult blood.

A barium enema demonstrated numerous diverticula in the left colon and a spastic sigmoid with saw-tooth margins that was nevertheless distensible. The rectum was displaced to the left.

FIG. 2. Case II. Filled and partially evacuated colon with diverticulitis. A pelvic abscess displaces the rectum to the left (arrow).

CASE III. (Fig. 3.) H. B., a sixty year old white male, complained of dysuria for one week and diarrhea for two days. His illness was accompanied by dull perirectal pain which radiated down his left leg. On admission the findings were left lower quadrant tenderness, midline rectal tenderness on digital examination, temperature 100°F., white blood count 11,800; the stools contained blood, mucus and pus. Sigmoidoscopic examination revealed rectal narrowing at 6 inches from the anus and a small mass of polypoid granulation tissue which was biopsied and reported subsequently as granulation tissue. Two ounces of purulent material were removed through the sigmoidoscope.

A transverse colostomy was done and during surgery a mass the size of an orange was felt deep in the pelvis. The diagnosis was diverticulitis with associated abscess.

Roentgen study of the colon had demonstrated the rectosigmoidal region to be attenuated and the barium suspension filled an irregularly outlined abscess pocket lying between the rectum and the sacrum.

CASE IV. (Fig. 4.) G. M., a forty-nine year old colored female, was admitted complaining of lower abdominal pain which had begun seven days previously together with diarrhea. Three days before admission she began to vomit and to pass bloody stools. On admission the findings were an enlarged rigid abdomen with left lower quadrant tenderness, a palpable mass the size of an orange in the left lower quadrant, hyperperistalsis, temperature 102°F.; white blood count 15,600, and stools negative for occult blood. Sigmoidoscopic examination was difficult due to spasm; the mucous membrane was congested and reddened; at 22 cm. a yellowish discharge was seen and considered to be pus.

FIG. 3. Case III. Pelvic abscess, secondary to diverticulitis, outlined by barium (arrow).

Barium enema examination demonstrated a spastic sigmoid and an increased transverse pattern of the rugae over a large section of the

FIG. 4. Case IV. Extrapelvic abscess outlined by barium (arrows).

sigmoid and descending colon; a large abscess cavity communicated with the proximal sigmoid colon.

### FISTULAS

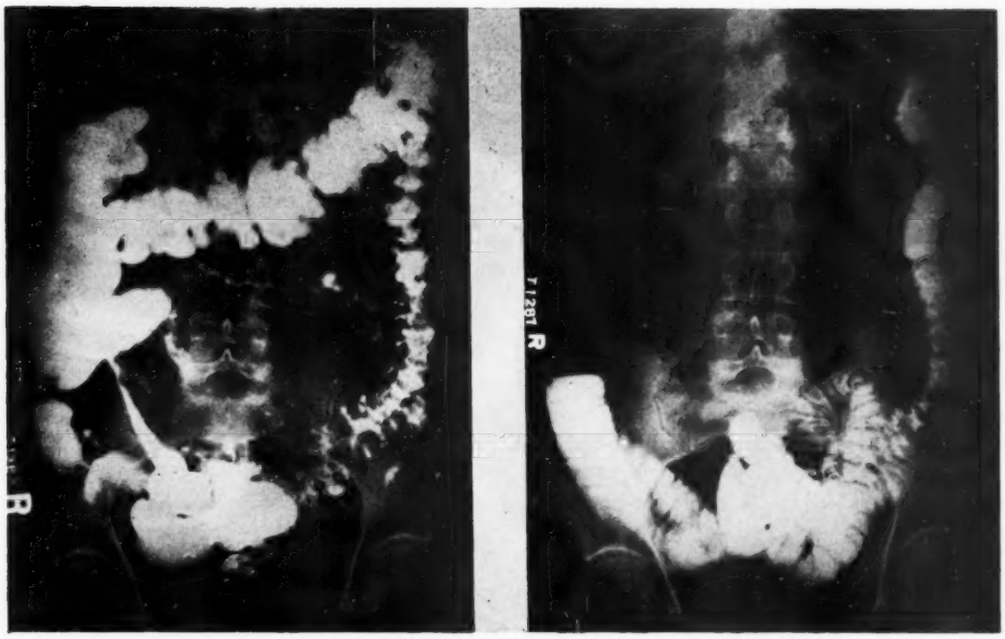
Fistula formation as a complication of diverticulitis is quite common. About 10 to 15 per cent of all cases of diverticulitis that have surgery also have bladder fistulas.[4] In 1936 Higgins[12] studied 328 cases of vesicocolic fistulas; 160 of these were due to inflammatory lesions and of this group 57.5 per cent were due to diverticulitis. There were more cases due to diverticulitis than to the total of all abdominal carcinomas, and, indeed, there were almost twice as many as from carcinoma of the colon alone. Fistulas have been found communicating with the ureter and also with the stomach.[4] A fistula with its origin in an area of diverticulitis can cause a clinical picture which may be confused with regional ileitis.[10] When diverticula are not demonstrated, carcinoma will usually be considered the origin of a fistulous tract. Therefore, when the differential problem arises, it is best to give barium by mouth in an effort to demonstrate the sacs of the diverticula if the patient is not obstructed.

The following two cases are representative of enterocolic and vesicocolic fistulas respectively:

CASE V. (Fig. 5.) M. J., a fifty-eight year old white female, complained of episodes of diarrhea during the past ten years. During the last year the frequency increased so that every two weeks there was a severe diarrhea which continued for one week. The stool was watery and slightly yellow, without an offensive odor. No blood was ever noticed in it. She had had a hysterectomy twenty years before. On admission the findings were a normal abdomen except for suprapubic and right inguinal scars, temperature 99°F., white blood count 14,600, and stools negative for occult blood. The surgical findings were many small diverticula of the left colon, a fistula 2 cm. long and 2 cm. in diameter connecting the mid-ileum and sigmoid colon. The fistula was isolated, resected and its ends inverted. A cervical stump was noted to be normal.

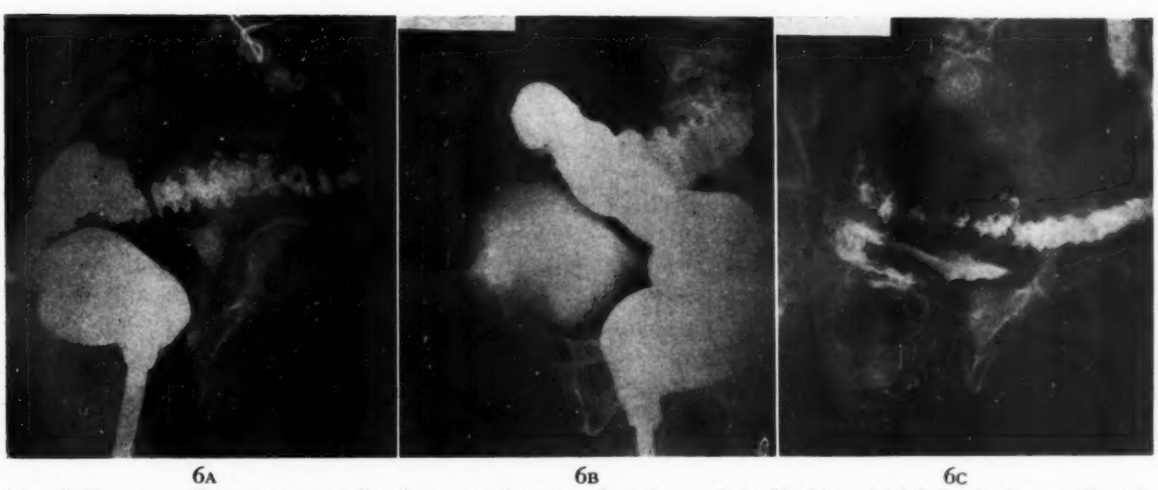
The first barium enema (Fig. 5A) demonstrated numerous diverticula and the typical pattern of a diverticulitis. The fluoroscopist noted barium in the small bowel before the cecum had filled, but failed to identify the point of abnormal connection. Subsequent study (Fig. 5B) indicated that the small bowel filled at the same time as the sigmoid colon.

CASE VI. (Fig. 6.) C. M., a thirty-eight year old white male, was admitted with the chief complaint of the passage of air and fecal material through the urethra for one month. For the year prior to this there had been some transient lower abdominal discomfort. For several days



5A 5B

FIG. 5. Case V. A, Demonstrates an extensive diverticulitis; B, evidence of an enterocolic fistula.



6A 6B 6C

FIG. 6. Case VI. A, Demonstrates a fistulous tract between the colon and the bladder which is beginning to fill with barium; B, demonstrates the bladder completely filled; C, shows the post-evacuation appearance of both organs.

before hospitalization there had been chills and fever. On admission the findings were an abdomen normal to palpation, cystoscopic evidence of a fistulous opening above the left ureteral orifice, the sigmoidoscopic finding of edema of the rectosigmoidal mucosa, temperature 98.6°F. and a white blood count of 8,800.

Barium enema examination demonstrated the characteristics of diverticulosis and diverticulitis, the fistulous tract and its continuity with the bladder.

### OBSTRUCTION

Localized inflammatory processes will subside more often than they go on to perforation. The bowel wall may become perfectly normal. However, if recurrence follows recurrence the wall will become thickened. In such instances the reduction in size of the lumen may cause an obstruction. In fact, Brown and Marcley[5] state that two-thirds of the cases of diverticulitis have their complaints based on obstruction and inflammation and only one-third on inflamma-

7A 7B

FIG. 7. Case VII. A, Roentgenogram of extensive diverticulitis of the sigmoid and distal descending colon; B, two months later the barium does not pass the rectum.

tion alone. The obstruction period can be designated as the stage of infiltration due to edema and infiltration and is due to a marked thickening of the mesentery and all the bowel coats.[3]

Obstruction, even when it is only relatively prominent in the clinical syndrome, is more apt to be complete when studied by the retrograde method than the clinical features would suggest, that is, the normal bowel content seems to pass distally with greater ease than the complete obstruction demonstrated by the barium enema would suggest is possible. Apparently the spasm induced by the ascending column of barium is so great that the lumen of the bowel is completely closed off. With a very cooperative patient it is sometimes possible to "wait out" this initial period of spasm, find that it is transitory, and discover the exact cause by visualizing the colon proximal to the spastic portion. In cancer the enema will usually get by because the sloughing of the tumor tissue leaves a canalized area in which spasm does not occur; this may happen even in a completely annular tumor. The obstructive manifestations on the plain roentgenogram can be classical and the bowel distention can be followed even into the small bowel.

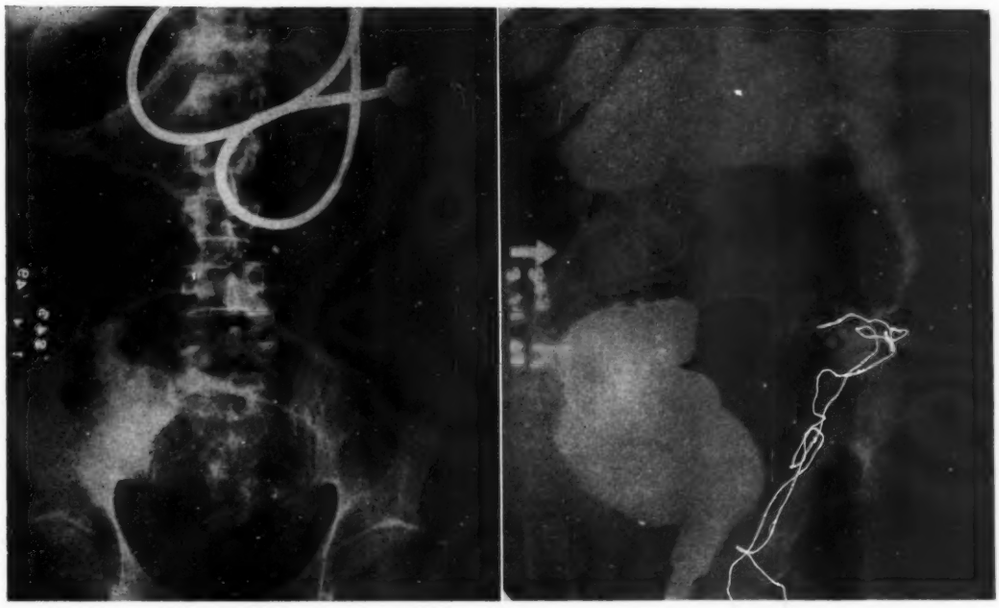
Occasionally, we have met with success in cases showing obstruction to barium by insufflating the colon with air. Some air gets through and identifies the lesion with fair accuracy.

If one can wait for several days in cases in which the differential diagnosis has not been possible on admission, the bowel then can be decompressed, and with the subsidence of the acute phase the lesion will be more readily identified.

The following cases illustrate: (1) a diverticulitis of the sigmoid subsequently progressing to obstruction to the retrograde barium; (2) an obstructed colon later shown to be due to diverticulitis after a period of watchful waiting and (3) a case illustrating the helpfulness of air in outlining diverticula in an area of obstruction.

CASE VII. (Fig. 7.) I. G., a fifty-eight year old white male, was admitted complaining of having been awakened during the night by sharp abdominal pain which later became aching in character. This persisted for four hours and then localized in the left lower quadrant. At this time he began to vomit. On admission the findings were left lower quadrant tenderness and rebound tenderness, temperature 98.8°F. and a normal white blood count. A cecostomy became necessary. This patient was known to have diverticulitis for several years.

Several roentgen studies prior to admission had demonstrated a very extensive sigmoidal



8A 8B

FIG. 8. Case VIII. A, Roentgenogram demonstrating mechanical obstruction; B, barium enema, after decompression and subsidence of the acute phase, indicates the cause of the obstruction to be a diverticulitis.

and distal descending colon diverticulitis (Fig. 7A); two months later the barium could not be made to progress above the rectosigmoidal region. (Fig. 7B.) It will be noted in Figure 7B, however, that the bowel is not completely occluded organically since there is no evidence of gas in the more proximal colon. Despite the complete obstruction to the retrograde flow of barium due to spasm, the patient continued on an outpatient status for four months.

CASE VIII. (Fig. 8.) H. B., a fifty-nine year old colored male, complained of bilateral lower quadrant soreness. He had felt well until two weeks previously when nocturia and urinary frequency had begun. One week before admission he had a fever of 103°F. and his feces were liquid in character. During the last few days there had been no bowel movements and his appetite was poor. He had lost 15 to 20 pounds in the two weeks. On admission the findings were tenderness and muscle guarding in the lower abdomen, particularly on the right, the presence of a mass anterior to the rectum above the level of the prostate, temperature 100°F. and a white blood count of 17,950.

The laparotomy note indicated that an inflammatory mass involved the pelvic small bowel and sigmoid colon and was adherent to the bladder. No free purulent material was found. No attempt was made to separate the adhesions. (The appendix was atrophic.)

Roentgenograms of the abdomen indicated the presence of a mechanical obstruction on admission. (Fig. 8A.) After subsidence of the acute phase and relief of obstruction by intubation, a barium enema demonstrated an extensive diverticulitis of the sigmoid and distal descending colon. (Fig. 8B.) (This patient was subsequently admitted with a rectovesical fistula.)

CASE IX. (Fig. 9.) J. M., a fifty-four year old white male, was admitted complaining of left lower quadrant and peri-umbilical pain which had begun two years before. Five months prior to admission the stools had become pencil-size and at this time he noticed alternating periods of constipation and diarrhea. There had been a weight loss of 12 pounds in six months. On admission the findings were a mass lesion with indefinite borders in the left lower quadrant with local tenderness, temperature 98°F. and a normal white blood count. The sigmoidoscopic study revealed a mass of granular soft polypoid tissue involving one-fourth of the bowel circumference from the 7½ inch to 9 inch levels; purulent discharge exuded from the lower end of the mass upon manipulation of the instrument; the lesion did

9A 9B

FIG. 9. Case IX. A, The distal colon is obstructed to the retrograde flow of barium; B, a double contrast study outlines diverticula and shows concentric gradual narrowing of the lumen in the diseased area.

not look grossly malignant and was believed to be due to a peridiverticular abscess.

At surgery a large inflammatory segment was found in the sigmoid with associated induration of the mesentery.

Barium enema study demonstrated that the lesion was obstructing. Double contrast examination, however, indicated the presence of diverticula and outlined the distal portion of the lesion with clarity indicating that there was a gradual transition from normal caliber bowel to the stenotic portion without the shelving defect so often seen with carcinoma.

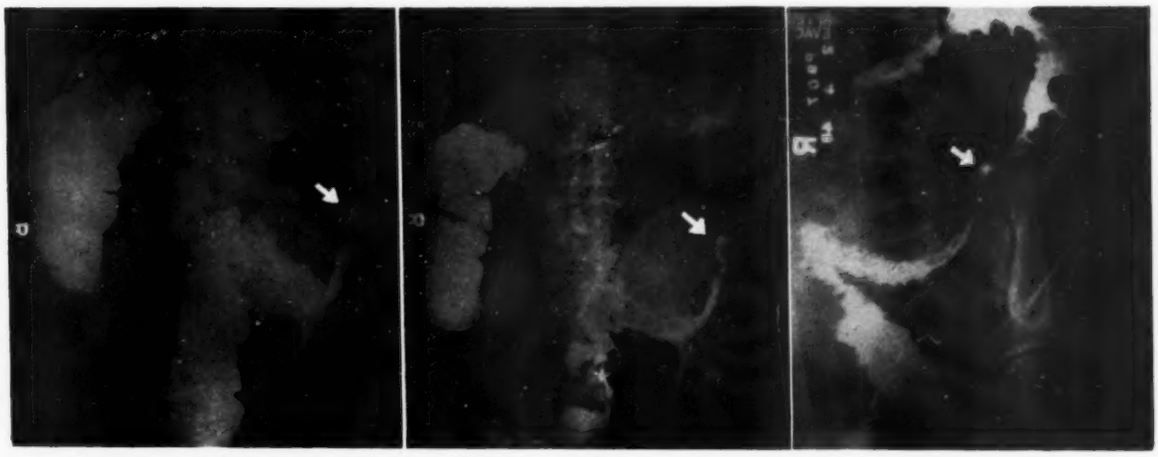
### DIVERTICULAR DISEASE AND CARCINOMA

The complications of diverticulitis that have been discussed are also the complications of neoplasm in the same region. In the differential diagnosis there may be features that are helpful. The area of involvement in sigmoiditis is usually of greater length than in carcinoma. Mucosal contours are much better preserved in the constricted area. When a mass is present, it is more likely to be tender. As mentioned before, when obstruction is a feature, the spasm usually makes it complete. Generally when the entire lesion can be outlined in both, it will be noticed that cuffing, overhanging edges or shelving occurs in carcinoma at the extremities of the lesion; that is, there is abrupt transition between relatively normal and abnormal bowel; whereas in the inflammatory region this feature is absent and a more gradual transition is apparent.

Concerning the occurrence of carcinoma with diverticulitis, there is agreement that there is no etiologic relationship. Wells[13] states that the incidence of carcinoma in the diverticulous patient is no different from its incidence in the non-diverticulous patient. Martin and Adsit[2] in a review of 201 cases of diverticulitis encountered concurrent carcinoma in 2.5 per cent. Probably the degree of frequency of the presence of both is not as important as to recognize that the changes of diverticulitis may obscure a new growth. The inference should not be drawn that a constricted area in a colon containing diverticula is always due to diverticulitis. This coexistence is always a threat.

The problems then in a non-obstructed case, are two: that an active diverticulitis and a carcinoma can be present in the same area and the latter overlooked; or that a non-inflammatory diverticulosis and a carcinoma can be in the same area and the latter considered as an inflammatory segment.

CASE X. (Fig. 10.) F. D., a sixty-four year old white male, was admitted with left lower quadrant colicky pain, irregular in occurrence, even awakening him at night, for the past several weeks. There was a constant diarrhea. There had been no weight loss. On the day of



10A 10B 10C

FIG. 10. Case X. A and B, Demonstrate the pre-evacuation and post-evacuation appearance of a colon in which almost the entire left half is involved with diverticulitis; C, oblique projection of the distal colon. Arrows point to a solitary filling defect, constant in appearance, due to an ulcerating carcinoma.

admission he passed bright red blood with his stools. Two weeks previously a barium enema examination by another radiologist was reported to have shown extensive diverticulitis. On admission the findings were left lower quadrant tenderness, a well demarcated firm mass extending from the left lower quadrant into the left upper quadrant, an indurated area felt high in the left cul-de-sac by rectal examination, sigmoidoscopy negative for 10 inches, temperature 98.8°F. and white blood count 11,650.

Palliative surgery only was done since there were metastatic nodules in the liver, spleen and peritoneum.

The roentgen examination of the colon had demonstrated extensive involvement of the colon wall from the sigmoid to the splenic flexure. For the most part this was due to diverticulitis. However, fluoroscopically and radiographically it was evident that when the entire lesion was considered, there was one short segment, the appearance of which never changed and was different from the other areas. (Fig. 10, arrows.) Here abrupt transition from inflammatory bowel, which was nevertheless still distensible, can be seen at each edge; stenosis is constant, membrane pattern absent and the lesion eccentric and ulcerated.

CASE XI. (Fig. 11.) E. W., a seventy-six year old white female, entered the hospital with a two-week history of intermittent abdominal cramps. These increased in severity and she began noticing difficulty in urination. Although there was some nausea and anorexia, she had not had any change in bowel habits nor in the appearance of the stool. On admission the findings were tenderness and rebound tenderness to deep palpation in the right abdomen, temperature 99°F., normal white blood count and stools positive for occult blood.

A rectrograde barium study was begun but not completed because of a short segment of markedly attenuated sigmoid. The abdominal film showed a tremendously dilated cecum with gas accumulating in the small bowel. (Fig. 11A.) The distal colon was collapsed and not distended despite the annular sigmoid lesion. There were numerous diverticula in the sigmoid and distal descending colon.

The causes for this strange situation were an obstructing carcinoma of the ascending colon identified at cecostomy. This obstruction accounted for the fact that the second lesion in the sigmoid was not giving signs of apparent obstruction above it. The features of this latter lesion, typical of carcinoma, are shown in figure 11B on a spot roentgenogram. This second carcinoma (Fig. 11A, arrow) was within the area of diverticulosis.

## SUMMARY

Diverticulitis, a frequent disease after the age of forty, produces numerous intra-abdominal complications, but because infection occurs predominantly in the distal colon, most of the secondary changes will be in the pelvis and left abdomen. These secondary changes are a direct result of infection and give rise to abscesses and fistulas which can communicate with many

11A 11B

FIG. 11. Case XI. A, Roentgenogram demonstrates dilated cecum and small bowel, collapsed distal colon, diverticulosis and an annular rectosigmoidal lesion (arrow); B, spot roentgenogram of the carcinoma at the rectosigmoidal junction.

organs, but most frequently with the bladder. There are also obstructive manifestations. All of these may simulate carcinoma. Representative cases are included which illustrate the more common situations met by the roentgenologist.

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# INTESTINOVESICAL FISTULA*

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INTESTINOVESICAL fistula is one of the more serious problems with which we are occasionally confronted. The importance of the subject cannot be overemphasized. Since patients with this condition are usually observed by both the general surgeon and the urologist, I shall attempt in this article to summarize briefly some of the clinical data and diagnostic problems presented by these patients.

While it is to be remembered that the etiologic factors producing the intestinovesical fistulas may vary somewhat in a collected series of cases, it is to be noted that approximately 50 per cent of the cases are due to diverticulitis of the bowel. The internist and surgeon should always bear in mind that any patient with diverticulitis of the bowel is a potential candidate for the development of an intestinovesical fistula.

Communications between the bowel and bladder have been recognized for many years, and a sufficient number of cases of all types of fistulas have been reported to emphasize the variability and provide suggestions for their management. With our modern diagnostic procedures and some clinical acumen we should be able to make the diagnosis of impending intestinovesical fistula and institute prompt surgical measures for relief.

Harrison Cripps[3] in 1888 published his monograph based on a study of sixty-three cases and little of fundamental importance has been added to the subject since his report. During the past few years several excellent articles on this subject have appeared. Peters, Higgins, Kellogg, Mayo and Miller, Barnes and Hill, Ormond and many others discuss in detail the symptoms, diagnosis and treatment.

Morrisey[8] called attention to the importance of inflammatory disease in viscera adjacent to the superior pelviorectal space in association with some of these cases. Herbst and Miller[4] reported the occasional occurrence from foreign bodies in the intestinal tract.

In their recent article Mayo and Blunt[6] limited their discussion to cases of vesicosigmoidal fistula due to diverticulitis. Their study included only those cases in which pathologic examination revealed diverticulitis of the segment of the sigmoid removed. The material consisted of 202 cases of proved diverticulitis of the large intestine and forty-six cases of intestinovesical fistulas were found, all between the sigmoid and the bladder.

Intestinovesical fistula may be conveniently classified into four groups depending upon the etiologic factors producing the fistula as follows: congenital, traumatic, inflammatory or neoplasm. In the congenital group there may be associated congenital anal anomalies or high degrees of urinary or intestinal tract anomalies such as a persistent cloaca. In the traumatic group surgical procedures account for approximately half of the cases, with gunshot wounds the next commonest cause. In the inflammatory group diverticulitis of the sigmoid is the commonest cause. In the neoplasm group carcinoma of the rectum and the sigmoid is the commonest cause and an occasional case is observed in which the neoplasm is primary in the urinary bladder, as occurred in one of the patients in our series.

Intestinovesical fistula may occur at any age but is more common between the ages of forty and seventy. In this age group naturally fall the majority of cases of diverticulitis and malignancy of the sigmoid and rectum. In infants and young children the cases are largely congenital in origin. It is considered to be approximately five times more common in men than in women, probably due to the presence and position of the uterus and to the less frequent occurrence of diverticulitis of the sigmoid in women. In the cases we have observed none of the patients were children. The youngest patient was twenty-six and the oldest seventy-two.

During the past three years we have had six cases of intestinovesical fistula. One patient, a man aged sixty-eight, was admitted because of cystitis and the passage of gas and stool

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particles in the urine. Death occurred before the cause of the fistula could be determined. In three cases the lesion was secondary to an inflammatory reaction. In one case, that of a seventy-two year old woman, it was secondary to diverticulitis of the sigmoid. In another case there was an inflammatory lesion of the sigmoid in a forty-two year old man, probably secondary to diverticulitis, with an associated regional enteritis of the terminal ileum. In another patient, a sixty-three year old man, the lesion was secondary to carcinoma of the sigmoid which developed in an area of diverticulosis; a loop of terminal ileum was also involved in the intestinovesical fistula. In our previously reported cases and in this group the majority were due to neoplasms. In one instance a diagnosis of impending intestinovesical fistula was made. The patient was a sixty-two year old man with diverticulitis of the sigmoid and a lesion of the cecum and it was considered unwise to attempt x-ray examination prior to operation. At operation an area of diverticulitis of the sigmoid was found attached to the urinary bladder. The lesion in the cecum was found to be carcinoma and was not involved in the pelvic process.

Statistics vary considerably regarding location of the fistulas. However, it appears that they occur in about equal numbers between the rectum and bladder and between the sigmoid and bladder. If one includes the appendix and cecum with the remainder of the large intestine, approximately 90 per cent of the cases are accounted for; 10 per cent occur between the small intestine and the bladder.

### PATHOLOGY

The fistula, generally speaking, is a direct passage when it is due to a neoplasm. When it is secondary to inflammatory disease, it nearly always develops after a localized abscess formation and is usually a tortuous tract. In our case, which was secondary to a pelvic abscess following hysterectomy, a colostomy was established in the transverse colon and after several weeks of colostomy drainage the pelvis was explored and the sigmoid easily separated from the bladder. Even though a Foley catheter had been inserted into the bladder preoperatively and methylene blue solution injected, little leakage occurred and the tract was followed with some difficulty. In all fistulas the tract should be thoroughly débrided. In those cases due to diverticulitis of the sigmoid the inflammatory reaction is often so marked that at operation the fistula is frequently suspected of being due to carcinoma. Since the majority of fistulas occur between the rectum and bladder and the sigmoid and bladder, the openings in the bladder are usually found in the region of the trigone, on the left side, or on the posterior wall.

### SYMPTOMATOLOGY

As would be expected, a full discussion of the symptoms in this condition would be too extensive for practical purposes. Naturally there would be symptoms referable to the intestinal lesion and those due to involvement of the bladder. The variability of the symptomatology may best be illustrated by referring to the case of a sixty-three year old man who came to the Clinic only because of frequency and terminal dysuria and hematuria of several months' duration. His history disclosed several attacks of pain in the left lower abdominal quadrant, the first attack having occurred thirty years previously. History of the attacks suggested an intestinal origin, probably diverticulitis. There was no history of the passage of blood from the rectum. This patient had a carcinoma of the sigmoid occurring in the area of diverticulosis with a loop of the terminal ileum being involved in the fistulous process.

In those cases due to diverticulitis of the sigmoid the onset is usually gradual with repeated attacks of lower left abdominal pain, cramps and left lower abdominal tenderness. With these attacks there may be recurrent attacks of cystitis. However, in this group of cases recurrent attacks of cystitis alone may be present or precede any symptoms referable to the intestinal tract.

In one of our patients mild recurrent attacks of cystitis occurred for three years before pneumaturia developed and there were no symptoms referable to the intestinal tract. Cases of intestinovesical fistula postoperative in origin are usually ushered in with vesical symptoms. Chills and fever frequently accompany almost all types. Pneumaturia and the passage of feces through the urethra are usually spoken of as pathognomonic of intestinovesical fistula. Certainly this is true of the passage of fecal matter which does not, however, occur as often as pneumaturia. Pneumaturia is not pathognomonic of intestinovesical fistula since

it may be due to other causes. It may best be stated that if a patient complains of pneumaturia it should be considered to be due to an intestinovesical fistula until proved otherwise. The passage of urine through the rectum is another cardinal but rather uncommon symptom of intestinovesical fistula.

### DIAGNOSIS

In a few cases the history alone will be sufficient for a diagnosis. Examination should consist of cystoscopy, excretory urography, cystograms, gastrointestinal x-ray and proctosigmoidoscopy. Of these cystoscopy is probably the most valuable. In many of the cases the opening may be visualized and in a few cases an unsuspected fistulous opening in the bladder has been found at cystoscopy. Frequently the opening in the bladder is not seen, being obscured by an ulcerated or granulomatous area. Probing of the area with a ureteral catheter should be done cautiously to avoid creation of a fistula. Bubbles of gas or fecal matter extruding into the bladder may be observed. A biopsy from the area in the bladder should be made but is not always conclusive as to the presence or absence of carcinoma. We are appreciating the cystogram more and more as a valuable diagnostic adjunct. The defect in the contour of the bladder wall is best shown on film made with the patient in an oblique position. The defect somewhat resembles that of an infiltrating neoplasm of the urinary bladder. (Figs. 1–5.) Unless there is marked inflammatory reaction of the bladder wall or the intestinovesical fistula is due to carcinoma of the bowel extending through the bladder wall, a negative, filling defect in the cavity of the bladder is not observed as in a primary neoplasm of the bladder. The barium enema may demonstrate the fistula in approximately 20 per cent of the cases due to diverticulitis. The injection of methylene blue solution into the bladder or rectum may be made and observed for its passage from one to the other. When this occurs, it is a conclusive finding. Employment of these organic dyes in any other manner may be misleading. Proctosigmoidoscopic examination should be done in all cases. In a few instances changes suggestive of a fistula may be demonstrated.

### TREATMENT

In general it may be stated that no definite course of treatment can be outlined. The treatment varies according to the findings in each individual case. Most cases require a surgical procedure of some type. If we confine the discussion of the treatment of intestinovesical fistula to the curable cases which include the postoperative cases and those due chiefly to diverticulitis, there are several important points to be considered.

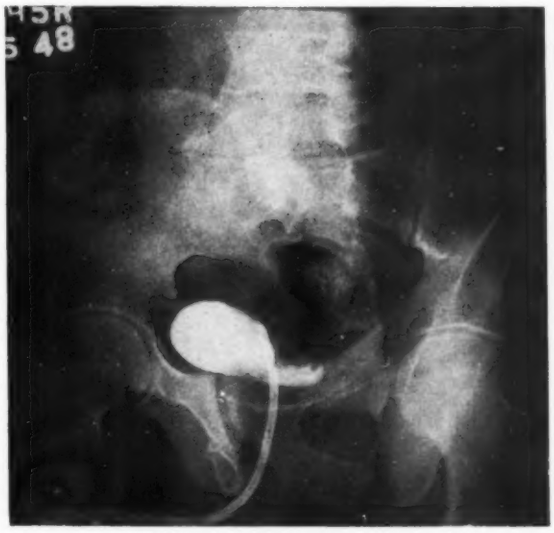
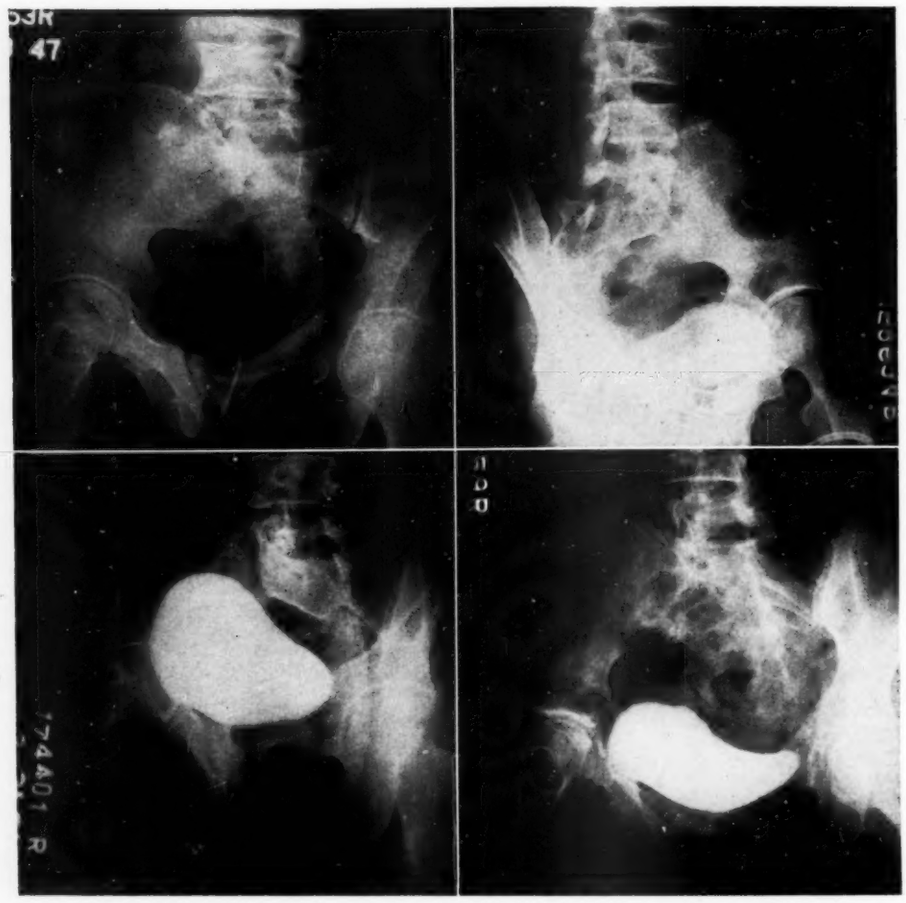


FIG. 1. A typical cystogram due to an infiltrating neoplasm of the urinary bladder.

In a few instances patients with a positive diagnosis of intestinovesical fistula have been known to go for years without any attempt at surgical correction. They are relieved of their vesical symptoms when they become annoying by appropriate medical therapy or local bladder treatment.

As I have previously stated, I believe that more thought should be given to the idea of preventing these lesions. While under observation and treatment for diverticulosis a patient in whom episodes of diverticulitis develop should be considered as a potential candidate for the development of an intestinovesical fistula. Certainly this complication does occur often, as does rupture of a diverticulum with peritonitis, obstruction or the development of malignant changes. Careful consideration should be given to the thought that an intestinovesical fistula may be developing in any patient who is suffering from an initial attack of diverticulitis, who has had recurrent episodes of diverticulitis or who, between episodes of diverticulitis and after the acute symptoms have subsided, has urinary symptoms commonly referred to as cystitis.



FIGS. 2 to 5. Cystograms made with a radiopaque iodine preparation or air in cases of intestinovesical fistulas showing the changes described in the text as very suggestive of this lesion.

Particular attention should be paid to the patient's vesical function and not too much significance attached to the absence of bacteria and the relative absence of cellular elements in the patient's catheterized urine specimen. We should always bear in mind that the combination of the sulfonamide drugs and the antibiotics which are employed so extensively in the treatment of diverticulitis may render a patient's urine sterile and relatively free from pus cells even though an inflammatory process may be attached to the bladder wall. However, such symptoms as frequency, nocturia, dysuria, discomfort of terminal voiding and pain in the suprapubic and bladder region are prone to persist. Should such a chain of symptoms occur, I believe that urologic investigations should be immediately instituted.

It is to be remembered that the symptomatology of diverticulitis itself may be extremely vague and confusing. This statement may be best illustrated by referring again to the history of the patient whom we thought had an impending intestinovesical fistula. This patient, a man sixty-two years of age, came to the clinic on the thirty-sixth day of his illness. His chief complaints upon admission were weakness, fatigue, anorexia, afternoon fever, frequency and nocturia. He had been essentially well until the onset of his illness which began with weakness, fatigue, anorexia and distress in the lower abdomen. The patient's urinary symptoms which consisted only of frequency day and night did not begin until approximately ten days following the onset of his illness. He had been treated with antibiotics and other medications for an extended period before coming to the Clinic. His urine on admission was normal in all respects. Cystoscopic examination revealed findings suggesting pressure from an extravesical mass. Urologic examination which included excretory urograms was otherwise nor-

mal. A cystogram made with air was considered to be within normal limits. Abdominal exploration revealed an area of diverticulitis attached to the urinary bladder and carcinoma of the cecum.

Carroll[2] reports the cure of two patients with intestinovesical fistula by destroying the lining of the fistulous tract by fulguration with an electrode introduced through a cystoscope. A Foley catheter was left indwelling following the procedure. This same method has been used in the treatment of small vesicovaginal and rectovaginal fistulas. In both of Carroll's cases the fistulas were secondary to diverticulitis.

One of the earliest forms of treatment suggested was the establishment of a permanent colostomy.

In a previous communication on this subject I stated that the importance of a preliminary colostomy of a type that prevents spilling of the fecal current from the upper into the lower segment of the colon with adequate time allowed for the inflammatory reaction to subside cannot be overemphasized. If the fistula occurs in the small intestine, colostomy is not indicated.

A review of the older literature reveals a high operative mortality when this procedure is not employed regardless of the underlying cause of the fistula. Incidence of recurrence is definitely greater following a one-stage repair. This point was emphasized in the recent paper by Barnes and Hill.[1] They noted that of the nine patients in their series on whom a one-stage repair was performed four either suffered a recurrence or presented a second fistulous tract which had not been recognized at the time of the operation.

I am in accord with the opinion of Ormond[9] who stated, "With the advent of the newer drugs and other methods of treating and sterilizing the bowel, it seems possible that in selected cases preliminary colostomy may be dispensed with." I am also in agreement with Barnes and Hill who reported, "If the patient's general condition is good and the fistula is a result of diverticulitis, a one-stage repair is usually successful; if excessive inflammatory reaction and induration are present, a two-stage operation is indicated. When it is difficult to complete the repair at the first operation, either a preliminary colostomy is done and the fistulous tract obliterated at the second operation, or the two-stage procedures performed at the same sitting, and the colostomy left open until the inflammatory induration has subsided and the bladder and bowel have entirely healed." Mayo and Blunt employed colostomy in the majority of their forty-six cases. In their summary they stated, "It is the opinion of one of us (Mayo) that primary resection of the sigmoid with or without colostomy and closure of the vesical opening will be employed with increasing frequency in the treatment of vesicosigmoidal fistula complicating diverticulitis."

There may be some differences of opinion among surgeons as to the position and type of colostomy to be employed. In our Clinic it is the consensus of opinion that unless a clear picture of the condition is obtainable, a colostomy in the transverse colon well away from the subsequent field of operation should be the position of choice. As previously stated marked inflammatory reaction and pelvic adhesions are pronounced in these cases. Thus with the colostomy in the transverse colon more room is allowed for the surgical attack on the fistula and the danger from contamination from the colostomy is much less than when the ordinary type of left inguinal colostomy is employed.

### PROGNOSIS

Due to the nature of the lesions causing intestinovesical fistulas the prognosis usually is grave and the necessity for multiple operations is usually attended with a high morbidity and high operative mortality. Spontaneous healing rarely occurs in these cases. In the traumatic and postoperative type and those due to diverticulitis a more favorable outcome may be anticipated. A small percentage may heal spontaneously and the remainder are usually amenable to surgery. Recurrence following operation has been reported.

### SUMMARY

Intestinovesical fistula occurs commonly enough to warrant, on the part of all the physicians concerned in the management of these cases, a common knowledge of the diagnostic and surgical problems involved.

Diverticulitis accounts for approximately 50 per cent of the cases of intestinovesical fistula. It is suggested that in patients with diverticulitis in whom urinary symptoms develop consideration should be given to the prospect of the development of an intestinovesical fistula.

Those cases due to diverticulitis are amenable

to surgical treatment and the number of recurrences is small.

The use of sulfonamides and antibiotics has made it possible to do more one-stage operations in those cases due to diverticulitis. At the same time in some cases these drugs may mask symptoms, with the development of a dormant abscess, so that medical treatment may be prolonged when earlier surgical intervention would have prevented fistula formation.

A preliminary colostomy is extremely important. In our experience when it is done in the transverse colon, it simplifies the surgical approach to the fistula.

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# SURGICAL ASPECTS OF DIVERTICULITIS*

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THE incidence of diverticula of the colon and rectum, location of such diverticula, age and sex incidence, symptomatology and complications of these lesions have been completely described in the literature[1–3,7] and already ably presented in this symposium. Our own experience in this regard can best be summarized by that of Wilkinson[8] at the clinic. He has personally reviewed 1,000 consecutive patients examined in the department of gastroenterology. In this group he found 101 patients, or 10 per cent, to have diverticula of the large bowel. The majority of these were in the rectosigmoid area. There were ten cases in this series in which he established a clinical diagnosis of diverticulitis, in two of which surgical intervention was required. Cases of diverticulitis requiring surgery, therefore, are uncommon. The following discussion is based on a review of the records of sixty patients operated upon for this condition at the clinic since 1938.

In general, it has been our policy to operate on only those patients with diverticulitis who have developed complications of their inflamed diverticula.

The majority of patients with diverticulitis who are given a low residue bland diet and the other usual measures to avoid constipation will continue indefinitely to have little or no trouble from the disease. It must also be remembered that many patients with left-sided abdominal symptoms in whom diverticula in the colon are demonstrated by roentgenography actually have an irritable colon syndrome and are not true examples of diverticulitis. This group also will be satisfactorily relieved with the usual treatment of irritable colon.

It is not uncommon to see patients in an acute episode of diverticulitis. Conservative measures are adequate for the majority of this group. During recent years, since we have prepared the colon more carefully for both sigmoidoscopic and roentgenographic examinations with castor oil or other laxatives, an acute exacerbation of an existing diverticulosis has occasionally been observed as a result of the laxative. We have not had to operate on any of these patients as surgical emergencies and the usual treatment of bed rest, local heat, limitation of diet, chemotherapy and sedation has been adequate to control the process. We have learned that when diverticula are known to be present or when the past history is suggestive of diverticulitis, laxatives should not ordinarily be used as a preparatory measure for radiographic studies. A low residue diet for a few days with colonic irrigations is safer.

An acute perforation of an inflamed diverticulum can develop, however, which may result in a spreading peritonitis if surgical intervention is not instituted. These episodes simulate those of acute appendicitis, except that the signs are predominantly left-sided. Pain, tenderness, spasm, fever, leukocytosis and the usual signs of an early peritonitis are present. For this condition, immediate surgical intervention is indicated. The ideal procedure is simple closure of the perforation with drainage if necessary.

Occasions may arise because of the condition of the diseased bowel when simple closure of the perforation is not adequate and a Mikulicz type of resection of the diseased segment of colon is required. Occasionally, when an extensive process is found, obstruction is suspected and closure of the perforation or exteriorization of the bowel is not possible, a proximal diversional type of colostomy is indicated in addition to drainage.

When an actual abscess has formed because of delay in seeking medical advice or delay in establishing the diagnosis, simple drainage of the abscess as a first stage is the procedure of choice.

These abscesses occur usually in the left lower quadrant, tend to point in the region of the left groin, may be palpated on bimanual examination through the rectum and are best drained, if possible, through an extraperitoneal left inguinal approach.

We believe that in good risk patients who have had a perforation or an abscess, the in-

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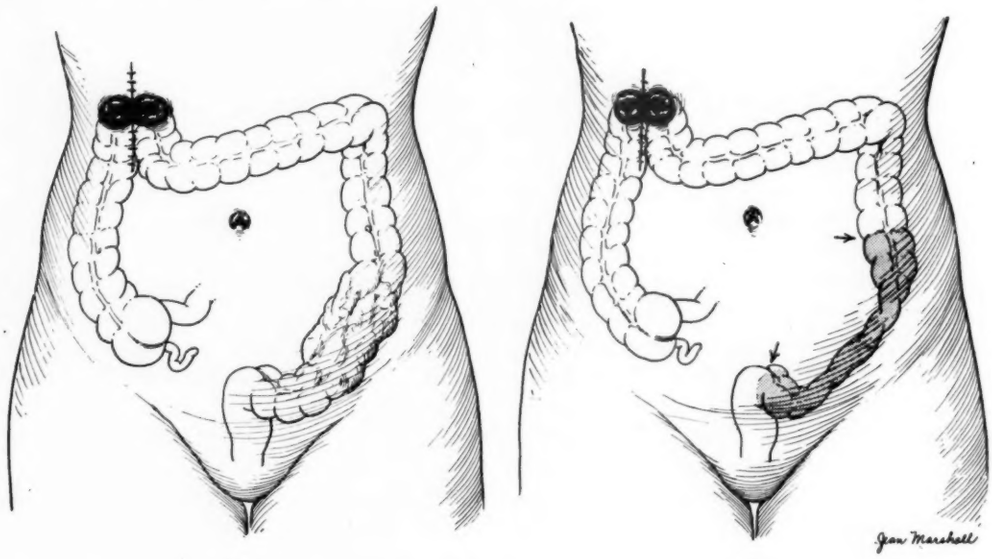
volved segment of bowel should be resected after the acute process has subsided.

A second group of patients with diverticulitis which will require surgery includes those in whom obstruction of the large bowel has developed. The most difficult problem which we have encountered in cases of diverticulitis, particularly when obstruction has developed, has been the differential diagnosis of these lesions from malignant disease. The absence of bleeding in the history and on proctoscopic examination suggests an inflammatory nature of the existing tumor, but in our experience between 15 and 20 per cent of patients with diverticulitis have a history of bleeding, and in two patients we advised and performed resection because of repeated hemorrhages.

Buie has very carefully described the proctoscopic findings in diverticulitis. For the experienced observer the relative immobility of the bowel, angulation, reduction in size of the lumen, absence of mucosal folds, sigmoidal sacculations and the occasional actual visualization of the openings of the diverticula themselves are pathognomonic of diverticulitis. They do not, however, rule out the presence of malignant disease at a high level in the bowel.

In most instances diverticulitis can be distinguished from malignant disease by radiographic studies. A long segment with concentric contours suggests an inflammatory process. In cancer the process is usually shorter and the edges are sharply defined and irregular. The continuity of the mucosa throughout an inflammatory lesion is the most important single radiographic evidence against a malignant process. Our radiologists, however, agree that in a small number of patients with obstructive tumors in the sigmoid, malignant disease cannot be ruled out before resection.




1A 1B

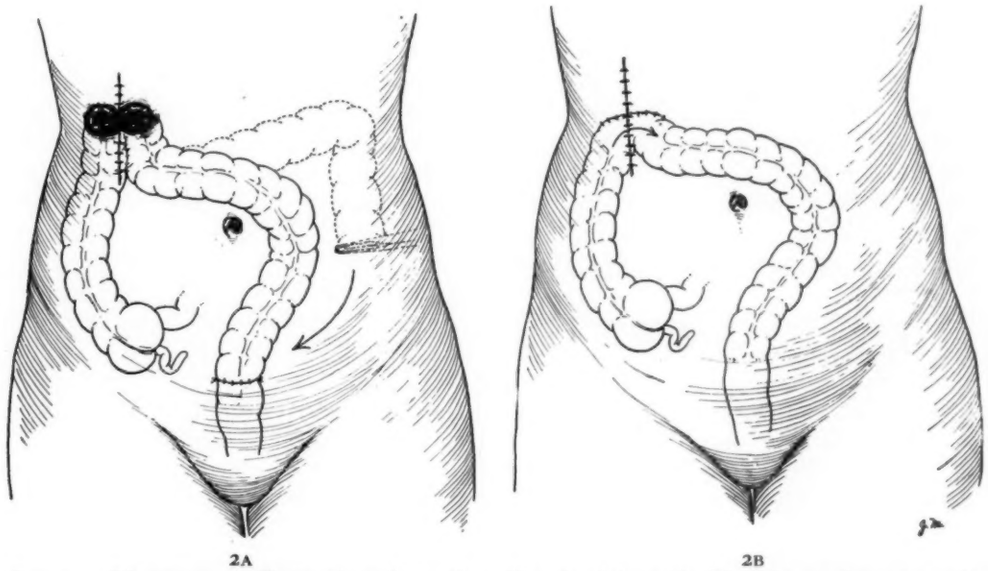
FIG. 1. Diagrammatic illustration of the three-stage procedure used in the surgical treatment of diverticulitis. A, First stage Mikulicz type diversion colostomy in right half of transverse colon. This type of colostomy allows later extraperitoneal closure; B, representation of involved area of left colon which will require resection after the acute process has completely subsided. This time interval is usually four to six months. (From COLOCK, B. P. The surgical treatment of diverticulitis. *S. Clin. North America*, 30: 911–917, 1950.)

The treatment of choice in cases of obstruction of the left colon due to diverticulitis, when it is reasonably certain that malignant disease is ruled out, is a right-sided, modified Mikulicz, double-barreled colostomy with complete diversion of the fecal stream. This procedure is demonstrated in Figures 1 and 2. After the acute process has subsided, usually in four to six months, the diseased segment of bowel can be resected, with primary anastomosis of the bowel. Soon after this procedure the colostomy can be closed as a third stage operation.

When the presence of malignant disease has not been ruled out by preoperative studies and when it is possible to examine the tumor in the left colon at the time of laparotomy, segmental

resection of the involved area should be done with immediate gross and, if necessary, histologic examination of the removed tissue. Usually in those segments of obstructed bowel due to an inflammatory process, after opening the removed specimen the intact mucosa will be

diverticulitis and which always requires surgical intervention is fistula formation. The most common fistula in these patients is that which communicates with the bladder. It occurs particularly in males, probably because of the interposition of the uterus in the female.[5,6]



2A 2B

FIG. 2. A, Diagrammatic illustration of resection of involved sigmoid with end-to-end anastomosis. The mobilization of the splenic flexure permits such an anastomosis to be performed without tension, even though a long segment of left colon is removed; B, extraperitoneal closure of colostomy performed after healing of primary anastomosis in left colon. (From COLOCK, B. P. The surgical treatment of diverticulitis. *S. Clin. North America*, 30: 911–917, 1950.)

obvious and rule out the presence of malignant disease. We have found that visual inspection and palpation of these tumors at the time of operation prior to segmental resection are unsatisfactory in this differential diagnosis. The presence of induration and edema in the mesentery and parietal peritoneum, so often found in the presence of diverticulitis, strongly suggests the inflammatory nature of these tumors but is not diagnostic.

There are occasions when, because of the nature of the process or the condition of the patient and even though malignant disease has not been ruled out, a first stage right transverse colon diversion colostomy may be necessary. In such instances the obstructed segment in the left colon should be resected as early as possible. In our experience, resection of the left colon should not be delayed more than two to three months when there is a possibility that malignant disease is present.

Probably the most serious complication which not infrequently develops in cases of

The subject of enterovesical fistula has already been presented in this symposium and will not be discussed in detail. Our policy has been to do a preliminary right transverse colostomy followed in four to six months by resection of the diseased sigmoid, with a primary anastomosis, closure of the bladder defect and a later third stage closure of the colostomy. It must be remembered that fistulas from a perforated diverticulum may develop in a wide variety of locations. We have had cases in which fistulas communicate not only with the bladder, but the vagina, small intestine, groin, perineal regions and scrotum. The treatment of each is an individual problem, but usually a preliminary colostomy is indicated, followed by resection of the process. In several of our patients, abdominoperineal resection, with a permanent colostomy, has been necessary to cure the disease.

There is another small group of patients with diverticulitis requiring surgical intervention. At laparotomy for a diseased gallbladder or a

fibroid uterus we occasionally find an elongated, palpable tumor in the left colon. There may have been no previous significant history of diverticulitis and radiographic studies of the colon may have shown only a few innocent appearing diverticula. Hayden[4] has mentioned suspending the sigmoid in such cases with the idea of preventing contact with the bladder and further formation of fistulas. In good risk patients actual resection of these tumor masses is indicated. An immediate primary anastomosis may be done; but if there is much inflammatory reaction present at the time of operation or if the process is extensive and a long segment of bowel must be removed, a proximal diversional colostomy should be performed at the same time.

The occasional case in which surgery is required for diverticulitis with repeated hemorrhages has been mentioned.

Finally, there is a small group of patients with diverticulitis who require surgical removal of their involved lesion because of failure to obtain relief of symptoms by the usual anti-constipation regimen. We have recently treated a patient with diverticulitis who, although at first he did very well and was comfortable on this program, later developed recurring pain and discomfort in the left lower quadrant on riding and with other forms of exertion. Following surgical removal of the tumor mass, he was completely relieved of his symptoms.

## CONCLUSION

In conclusion, surgical intervention is indicated in those patients with diverticulitis who have evidence of acute perforation, abscess formation, obstruction, who have a tumor in the left colon in which malignant disease cannot be excluded, fistulas, repeated hemorrhages, or in those patients who fail to obtain relief of their symptoms by conservative measures.

The type of surgical procedure indicated in these patients will depend on the general condition of the patient and the local condition of the process. For the patient with an acute perforation, simple closure of the perforation with a proximal diversional colostomy, when indicated, is the procedure of choice.

For the patient with abscess formation, incision and drainage, followed by resection of the diseased process after the acute phase of the disease has subsided are indicated.

For the patient with obstruction, the three stage procedure, the first a right transverse Mikulicz type of colostomy, the second, resection of the tumor and later, closure of the colostomy, is the usual treatment. In the presence of an obstructing tumor when malignant disease cannot be excluded, segmental resection of the involved area of the bowel and examination of the removed tissue should be done, whenever possible, before a final decision is made as to the operative procedure to be employed.

In cases of diverticulitis in which enterovesical or other fistulas have developed, the three-stage operation described is usually necessary.

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## DISCUSSION OF PAPERS BY DRS. SMITH, SWENSON, EWELL AND SWINTON

E. Parker Hayden (Boston, Mass.): I would like to thank Drs. Smith, Swenson, Ewell and Swinton for sending me their papers well in advance of this meeting. These four papers have covered the essential points in respect to diverticula of the colon and their complications.

I can add nothing to Dr. Smith's summary of possible factors in the production of diverticula, and I believe as he does that speculation about them is chiefly of academic interest.

I am still skeptical as to acquired diverticula being a *proven* source of bleeding from the bowel although there would seem to be no reason why they should not occasionally ulcerate and bleed and Dr. Smith's case does sound convincing. It is always safer, as he suggests, to consider this possible source last in one's thinking, and place emphasis on the exclusion of

polyps, cancer and anal canal lesions as much more likely sources.

The observation through a sigmoidoscope of inverted diverticula, which are thereby made to appear polypoid within the lumen of the bowel, is of real interest as a diagnostic point. I have observed this occasionally on the mucosal surface of a colostomy in patients whom I knew had diverticula at the time of resection of their rectum for cancer; and I have easily everted these polypoid excrescences temporarily by gentle, direct pressure with an instrument, which Dr. Smith mentions having accomplished himself by air pressure through the scope.

I have also observed occasionally what I considered to be fecal plugs from diverticula and have observed the openings of diverticula in the low sigmoid now and then. In most instances, however, spasm below the area of maximum involvement, with some redness and edema of the mucosa are the proctoscopic findings which suggest the presence of diverticulitis just above.

Dr. Swenson's figures on the incidence of diverticula as 5 to 10 per cent in several series of barium studies of the colon coincide closely with those of other authors and with a Massachusetts General Hospital series included in a study which Dr. Krolicki and I made, and which he reported before this Society at the San Francisco meeting in 1946.

I was glad to hear Dr. Swenson mention the difficulty, due to spasm, of getting barium to flow upward from below in some patients in whom there was no real obstruction to material coming down from above, and the desirability, also, of avoiding giving barium by mouth when there is evidence of obstruction in the flat film and from the patient's history.

The possibility of producing perforation of a diverticulum by the use of an enema in this disease must always be kept in mind and excessive pressure of fluid or air avoided.

The greater length of the narrowed area, as shown by x-ray in chronic diverticulitis, and the presence of mucosal detail throughout the narrowing have been mentioned as important points in the differential diagnosis from cancer.

Dr. Ewell has stressed the greater frequency of bladder fistula in men, due to absence of the intervening pelvic organs as found in the female, and he has pointed out the variety of symptoms produced by this complication. I think most of us would agree with him, and with Dr. Swinton, as to the desirability of a complete diversion of the fecal stream by transverse colostomy before attempting the separation of bladder and bowel and elimination of the fistula. It is my belief that the second operation should always include a resection of the affected segment of sigmoid, as mentioned by Dr. Swinton, rather than just a closure of the bowel end of the fistula, because of the irreversible chronic thickening of this area and the likelihood that, with later closure of the colostomy, the inflammatory episodes will recur. It has been my impression that the area of maximum thickening and obstruction in this disease is usually fairly high in the sigmoid rather than in the rectosigmoid area, and that, therefore, a resection with end-to-end anastomosis is almost always feasible instead of resection with permanent colostomy. However, the resection is often more difficult than in cancer due to the thickened short mesentery which Dr. Swinton mentioned, and mobilization of the splenic flexure may be necessary.

I have recently operated upon a woman in whom a surgeon, two and a half years ago, had resected a sigmoid mass which he thought was cancer, but in which the pathologist, whose report I have, could find only inflammation. The rectal stump had been closed in the pelvis with an end colostomy, and the patient came to me for re-establishment of continuity after two and a half years of good health and freedom from any symptoms. After removing the colostomy from the abdominal wall I found a small bowel loop adherent to the inverted end of the rectal stump in a suspicious appearing small area of induration. A frozen section of this area showed it to be carcinoma and I then carried out abdominal-perineal resection with establishment of a new abdominal colostomy. Presumably this had been present and very slowly growing since the original operation but may have developed later as a coincidence.

HARRY E. BACON (Philadelphia, Pa.): I should like to confine my comments to the surgical treatment of diverticulitis in order to conform to the by-laws of a five-minute discussion period of formal papers.

Dr. Ewell is to be congratulated upon his rational approach to the management of sigmoidovesicle fistula since each case is an individual problem. It has been the policy in our department at Temple to establish a transversostomy in the right upper abdomen through

a Singleton incision as a preliminary step followed in six weeks to three months by definitive surgery, namely, resection of the diseased segment of sigmoid, preferably by immediate end-to-end anastomosis with simultaneous repair of the bladder fistula. In two instances we performed a suprapubic cystostomy but now believe that reliance may be placed on urethral catheter drainage for seven to ten days.

TABLE I
DIVERTICULITIS
1940—MAY 1951—135 CASES
Palliative Operations

| Type | No. of Cases | Deaths | Per cent |
|---|---|---|---|
| Colostomy for obstruction | 5 | 1 | 20 |
| Incision and drainage of abscess | 3 | 1 | 33⅓ |
| Drainage for perforation without closure | 2 | 0 | 0 |
| Exploration | 2 | 0 | 0 |
| Sarcoma and carcinoma (lymphoblastoma of reticular cell type) | 1 | 0 | 0 |
| | 13 | 2 | 15.3 |

All are in hearty accord that the complications of diverticulitis, namely, obstruction, perforation, unresolved abscess, fistula formation and the inability to include malignancy, require surgical intervention, but it is appalling to observe the frequency with which palliative surgical procedures are performed without any subsequent attempt to institute definite surgery upon the disease process. (Rosser, Fansler, Mayo, Hayden, and Colcock are among the few who have shown the wisdom of removing the involved segment of bowel.) It is gratifying, indeed, to hear that Dr. Swinton, too, has broadened his indications and I would venture to state that his recommendations here today will go far toward establishing our surgical policy for tomorrow.

Another group to which I wish to refer are those who suffer recurrent attacks despite an adequate medical regimen. Must we await the development of complications or shall we cure these invalided patients by segmental resection? To me the answer is obvious: patients with recurrent episodes of increasing severity should be treated by resection, preferably during the quiescent period.

Our experience with diverticulitis over ten and one-half years has been confined to 135 patients; and while the series is not large, it represents a trend toward cure by surgical extirpation.

It is well to inquire as to the late results of diverticulitis for, as reported by Smithwick,

TABLE II
DIVERTICULITIS
1940—MAY 1951—135 CASES

| Resection | No. of Cases | Deaths | Per cent |
|---|---|---|---|
| Resection with primary anastomosis | 20 | 1 | 5.2 |
| Exteriorization (Mikulicz) | 7 | 0 | 0 |
| Abdominoperineal proctosigmoidectomy | 5 | 0 | 0 |
| Abdominoperineal proctosigmoidectomy with hemicolectomy | 1 | 0 | 0 |
| Sigmoidectomy with colostomy and exteriorization of closed rectal stump (partial cystectomy in four) | 6 | 0 | 0 |
| | 39 | 1 | 2.6 |

47.5 per cent were classified as unwell following palliative surgery only. Those who subsequently died of the disease amounted to 12.5 per cent. In contrast 84 per cent of his resected cases were well with no late mortality from recurrent disease. Only last year Boyden found that 95.6 per cent of his resected cases which had been followed one to sixteen years were cured of the disease. Inasmuch as the risk is so greatly reduced, our approach to the problem of diverticulitis should be materially broadened.

HYRUM R. REICHMAN (Salt Lake City, Utah): I shall confine my remarks to some of the observations I have made since my presence here. There are one or two things which in the last five or six years I have turned over in my mind, as you have, which I would like to emphasize. In the first place, it is definitely established somewhere between 7 and 10 per cent of American people over forty have diverticula in the colon; approximately 20 per cent of these have diverticulitis, and of this number somewhere between 5 and 10 per cent have a complication requiring surgery.

It has also been pointed out that this disease, by numbers, closely parallels that of duodenal

ulcer. There are other ways in which this disease parallels duodenal ulcer. Up until recently both diseases have been considered medical diseases until complications occur, such as hemorrhage, obstruction, perforation, or the possibility of co-existing malignant disease. In the last few years, however, there has been a marked change, and you cannot attend any surgical meeting now without noting a large percentage of that meeting devoted to the question of bettering the treatment for peptic ulcer.

Here the similarity of the diseases ceases, because as we heard this afternoon, and I quote from Dr. Swinton who said, "In general it has been our policy to operate on only those patients with diverticulitis who have developed complications of their inflamed diverticulum."

It seems to me then that it is high time we, as members of this group, do something to improve the treatment of those individuals who suffer from diverticulitis. I, therefore, was very pleased to hear Dr. Smith say, "Recently with the employment of the sulfonamide drugs and antibiotics, there is a great tendency to urge surgical intervention and cure rather than alleviation and palliation." And Dr. Swinton subsequently said, "Finally, there is a small group of patients with diverticulitis who require surgical removal of their involved lesion because of failure to obtain relief of symptoms by the usual anti-constipation regimen."

It is my firm conviction that this group of patients should be enlarged and many of them should be operated upon and resected by election. I believe that there is perhaps no disease involving the colon, lest it be chronic ulcerative colitis, in which it becomes necessary to individualize your patients for the treatment which you are going to recommend. However, as a base line in my own practice I have adopted some of the following principles:

To those patients who do not respond to medical management, I suggest the possibility of resection.

To those in whom the disease and symptoms become progressive in spite of medical management, I suggest the possibility of resection.

Those who have dysuria in spite of the absence of findings by the urologist, I urge to have resection; because these patients who are good surgical risks with adequate preparation, I have proven to my own satisfaction can be treated by one-stage resection with immediate anastomosis with good results. Here I believe bladder fistula necessitating multiple stage operations might be prevented.

There is one other point which I do not believe has been mentioned which I should like to emphasize, and that is the occupation of the individual suffering from this condition. It has been my observation that the symptoms are not always parallel to the extent of the diverticulitis as seen by x-ray. In many individuals, particularly those who by occupation are required to ride great distances, there seems to be a good deal more trouble than in others. I have in mind one patient particularly who rode great distances each month by car. I performed the resection with a one-stage procedure with an immediate anastomosis by the closed method in 1946 because I was afraid to use an open method. I have followed him very closely since and have asked him the question as to whether he felt it was worth while, and he has stated on several occasions, "If this disease returns"—and I have told him of that possibility—"I shall be resected without hesitancy."

One other individual, a rancher by occupation, who rides in the saddle all day long during the summer season, sought relief in several of our outstanding clinics. When he was not working, his disease subsided and he felt good; during his busy season his symptoms returned. This man was treated by resection and he likewise has had good results.

My close observation of these people has convinced me of the fact that many could be relieved and something more can be done for diverticulitis by elective and by prophylactic surgery than has been done in the past.

Another principle which I have set for myself is that those who have had a complication, except in very rare instances such as abscess, in which you might perform a one-stage procedure, should be treated by stage procedures. This is particularly true, in my opinion, in fistula, as has been clearly stated in this symposium.

LESTER J. JOHNSON (San Jose, Calif.): I would like to pose a question. All of the cases that we have discussed seem to have one region of the colon involved. I would like to ask our panel members if they have had much experience in encountering diverticulitis in various regions of the large bowel. This is prompted by the fact that we had one patient about seventy-four years old. When we first saw her, she was in very serious condition and was being treated

medically. She had x-rays showing the most advanced diverticulosis that I have ever seen. The diverticula varied from small to the size of a dollar. There was no part of that colon that looked worthy of saving.

When in consultation with Dr. Leon Goldman, of San Francisco, he suggested that I do a transverse colostomy rather than an ileostomy. I was a little bit fearful because I was afraid some other part of this bowel might go into a diverticulitis, even the ascending portion. He asked me bluntly, "Have you ever seen diverticulitis in two portions of the colon?" and I had to answer no.

What have you seen?

PAUL C. SWENSON (closing): Just briefly to comment on Dr. Hayden's remark about the possibility of injury from the barium enema, I think that is a very timely warning, because one of the very important things to emphasize is the extreme care that one should take. To give a barium enema is not easy. Remember that we are doing a procedure which is not without hazard. In the first place, one should be careful in putting in the tube because harm may be done. Always do the barium enema under fluoroscopic control so that one can control pressures and watch developments.

Dr. Johnson asked the question about multiple areas of involvement. I have seen one case in my experience in which there was a single diverticulum with an associated tender mass in the upper descending colon and at the same time a similar lesion located in the mid-ascending colon. Both were observed surgically; because of the multiple lesion, the surgeon did nothing about it and the patient was treated conservatively and recovered apparently so far as I know. I know there were two definite areas of diverticulitis proved in the same colon.

GEORGE H. EWELL (closing): I hope I emphasized to all of you the importance of colostomy in the treatment of intestinovesical fistula. If I understood Dr. Reichman correctly, I believe he was saying what I was also attempting to say, namely, that any individual, who has recovered from an episode of diverticulitis and who persists in having some urinary symptoms in spite of all the urologic examinations being negative, should have the benefit of surgical exploration of his or her abdomen.

Lastly, If I might digress for a minute as a urologist and proctologist, I am rather surprised at the low incidence of the number of cases of diverticulitis that come to surgery. I mean we hear of them every day, yet from Dr. Swinton's service—and we all know it is an extensive service—their incidence of the number of cases requiring surgery is very small. I believe that the emphasis Dr. Bacon and Dr. Reichman have placed on this subject is very worth while, and it would seem to me that the surgeon would be justified in advising surgery more often in some of the chronic cases in which the patient's activities are restricted and his diet sometimes inadequate for proper nutrition.

NEIL W. SWINTON (closing): Dr. Johnson, to my knowledge we have not had a case that has come to surgery with multiple lesions, but I have been impressed with the extent of some of these lesions. I think by far the majority of them begin in the sigmoid, but we have had them extend up as far as the mid-transverse colon.

# BENIGN LYMPHOMA OF THE RECTUM

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THERE is still much confusion regarding the nomenclature of lymphoid tumors, as pointed out by Hayes et al.[1] The term lymphoma itself is not listed in the American Lymphatic Registry; nevertheless, most clinicians and pathologists popularly refer to growths of lymphoid tissue as lymphomas.[2] The non-malignant type is called the simple or benign lymphoma to distinguish it from the malignant group which includes the lymphocytomas, lymphosarcomas and lymphoblastomas. We are not concerned with any direct discussion of the malignant group in this paper. Benign lymphomas are also called lymphadenomas, lymphadenoid polyps and lymphoid polyps. The latter terms are more prevalent in the foreign literature.

Since Ball reported the first case in 1890,[3] sixty-four cases of benign lymphomas have appeared in the literature. There is no doubt, however, that this lesion occurs much more frequently than is reported and that many cases are missed due to lack of careful tissue examination by competent pathologists. Furthermore, this tumor may be grossly indistinguishable from any other benign polyp or even from internal hemorrhoids.[4] This will be shown in a later paragraph. The lesion occurs equally in both sexes and may be found in all ages. Gabriel[5] reports a case in a four year old child and Li[6] reports one in a seventy-one year old female.

The incidence of involvement of different portions of the gastrointestinal tract has been reported by several writers.[6,10,11] The appendix, distal colon and rectum are the favorite sites of large accumulations of lymphoid follicles. Dukes and Bussey[12] have shown that these follicles, which lie in the submucosa, are present throughout the colon and are most numerous in the rectum. Their function is to produce lymphocytes and also to filter the lymph which is collected from the lymphatic vessels of the mucous membrane. It is for this reason that the lower rectum is the most common site for these benign lymphomas.

The lesion produced by a benign lymphoma has no characteristic symptoms. Its recognition may be only incidental to routine rectal examination. This occurred in one of our cases. Symptoms may be caused by the growth encroaching on the mucous membrane, resulting in atrophy, pressure necrosis and ulceration. Consequently, one may have bleeding, pain or protrusion into the anal canal. As shown by Tom E. Smith, the lesion may be mistaken for an internal hemorrhoid on proctoscopic examination. In fact, associated hemorrhoids may be present and distinguished only after tissue examination. There is no diagnostic hematologic picture in this condition, nor is there evidence of disease elsewhere in the lymphatic tissues. The nodules may vary in size from a few millimeters to about 8 cm. in diameter. They may be single or multiple and may be either sessile or pedunculated. The majority are polypoid but occasionally their firm, nodular feeling may give one a clinical impression of malignancy. Patients have been treated with irradiation or surgical resection of the rectum under the mistaken belief that the lesion was malignant.[7] It is the most common tumor of the lymphoma group. Local excision is not followed with subsequent evidence of recurrence or transformation into the malignant types. Recurrence was never found in any reported case in spite of follow-up for many years.[8]

These lymphoid growths arise from the lymphoid follicles lying in the submucosa and grossly produce a rather nodular, sharply circumscribed growth. The rectal mucosa overlying this nodular growth shows pressure atrophy and thus may be exposed to mechanical injury. Although it is non-encapsulated, the growth is well circumscribed because at the periphery there is a sharp demarcation between lymphoid and adjacent connective tissue. There has been no report of a case of benign lymphoma showing invasion of the underlying muscular coat.

These submucosal nodules resemble ordinary lymph nodes and consist of numerous lymphoid follicles, germinal centers and interfollicular reticulum. The lymphoblastic cells may show mitotic figures but ordinarily these remain well

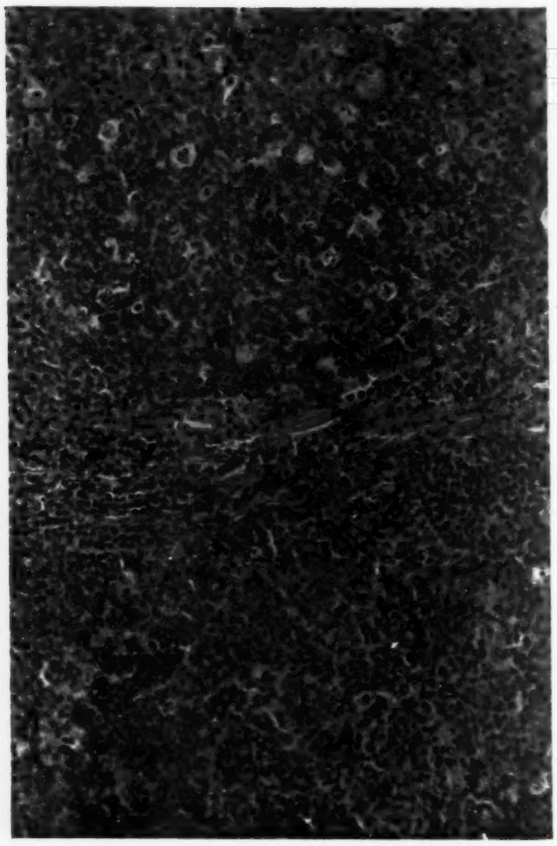

FIG. 1. Case I. Acute lymphoid hyperplasia; photomicrograph, × 150.

within the confines of the germinal center; however, as in one of the cases reported in this paper, the lymphoblastic cells were noted in the interfollicular areas. This plus pressure of mitotic figures may make an inexperienced pathologist apprehensive as to the possible presence of a malignant lymphoid tumor.

When lymphoid tissue is increased in quantity, it is often difficult to decide whether the condition is an inflammatory hyperplasia or a new growth.[13] The origin of these lymphomas is not known but several hypotheses may be presented. Lymphoid tissue can be stimulated to abnormal hyperplasia by different factors. Goldman states that in status thymicolymphaticus the rectal mucosa is studded with numerous enlarged lymphatic glands which are discrete and can be readily felt.[14] The lymphoid follicles in the distal colon and rectum may be exposed to irritants: chemical, inflammatory and traumatic.[15] It is suggested that these factors stimulate the production of abnormal hyperplasia which may result in such growths as benign lymphomas.

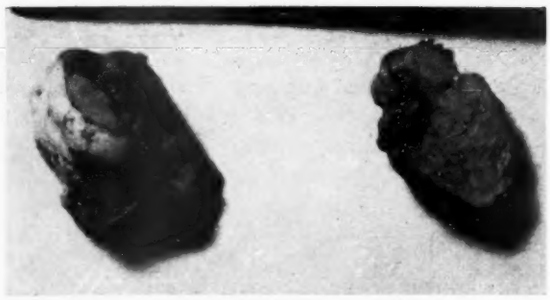

FIG. 2. Case II. Gross specimen bisected.

CASE REPORTS

CASE I. A sixty-three year old white male who complained of nervousness was under the care of his physician for mild hyperthyroidism. During routine physical examination two small rectal growths were noted. At no time did he have any anorectal complaints. At surgery a polyp was excised. This was situated at the right posterolateral quadrant about 5 cm. from the anal verge. The polyp was about 2 cm. in diameter, flat and covered by mucosa. Another smaller polyp about the size of a pea covered by mucosa was situated in the posterior quadrant about 4 cm. from the anal verge. It was excised in a similar fashion.

Pathologic report revealed that both grayish brown masses consisted of large lymphoid follicles of the submucosa. (Fig. 1.)

The patient was last seen four years after surgery, at which time the mucosa was normal.

CASE II. A fifty-six year old white female had a sudden and rather profuse rectal hemorrhage. The bleeding was bright red, not mixed with stool and not attended by pain or any other complaint. Rectal examination revealed a polypoid mass 4 cm. in diameter directly anterior to the coccyx. On palpation the mass was not painful or tender but bled profusely.

The tumor was excised with its base and the mucosa was closed with chromic catgut. This rectal mass was spherical with an irregular border, pale tan and 4 cm. in diameter. The mass was made up of nodular hypertrophy of lymphoid tissue and had encroached upon the rectal mucosa to cause ulceration. (Figs. 2 and 3.)

CASE III. A thirty-four year old colored female complained of rectal bleeding with occasional protrusion for six years. Examination revealed hemorrhoids, a posterior anal ulcer and a polypoid mass about 3 cm. in diameter approximately 5 cm. above the anal verge in

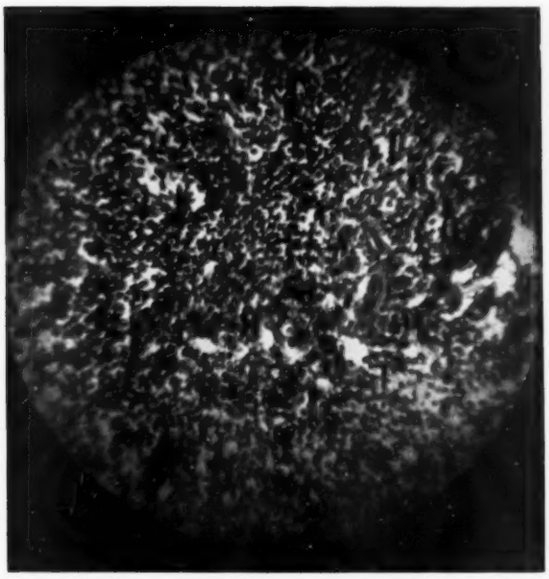

FIG. 3. Case II. Photomicrograph showing lymphoid hyperplasia.

FIG. 4. Case III. Atrophy and ulceration of the mucous membrane secondary to nodular lymphoid hyperplasia; photomicrograph, × 90.

the posterior quadrant. The mass was firm, lobulated and covered by mucosa. The polypoid growth was excised and the ulcer and hemorrhoids removed.

Pathologic report was as follows: A multinodular mass of lymphoid tissue occurring above the mucocutaneous junction produced polypoid architecture of the overlying mucous membrane. (Fig. 4.)

CASE IV. A twenty-five year old white male complained of constipation only. On routine physical examination his physician found a rectal polyp and referred him to proctology. Examination revealed two small polyps about 1½ cm. in diameter, sessile and discrete, situated 5 cm. from the anal verge; one polyp was on the anterior and the other on the left lateral quadrant. The patient was operated upon and the growths excised.

FIG. 5. Case IV. Nodular lymphoid hyperplasia; photomicrograph, × 90.

Pathological report revealed that follicular areas of lymphoid tissue bulging into the submucosa of the rectum were found. The mucosa in various areas was atrophic due to pressure. There was a question in this case whether the diagnosis was possible lymphoblastoma with sarcomatous degeneration since some sections showed invasive tendencies. Pathologic and surgical consultation leaned toward a diagnosis of benign tumor. This patient was followed up for four years. When last seen his rectal mucosa was normal and he felt well. (Fig. 5.)

## SUMMARY AND CONCLUSIONS

1. Four cases of benign lymphomas of the rectum are reported. This together with a review of the literature forms the basis for this paper.

2. The concepts as to the possible origin of this lesion are presented. No conclusions can be reached whether it is hyperplasia or a simple tumor.

3. The lesion presents certain features which may be mistaken for malignancy.

4. This growth is more common than the scarcity of the reports in the literature would indicate.

5. Emphasis is placed on the necessity for careful microscopic examination of all tissues removed.

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DISCUSSION

John McGivney (Galveston, Tex.): We are indebted to Dr. Sniderman for reporting these interesting cases to us and for refreshing our memories on the subject. He leaves me only an opportunity to enlarge upon a few points of interest.

I think we are all becoming increasingly aware of these benign lymphomatous growths of the lower bowel. Each year a new group of cases is reported in the literature, until now they are no longer relegated to the realm of rarity. This in itself is evidence of a new vigilance against them.

The relatively normal appearance of the follicular structure of these growths and the frequent presence of phagocytic cells within their follicles has given rise to speculation by E. B. Helwig that they represent benign lymphoid hyperplasia rather than neoplasms. If this is true, it is certain that infection entering by way of the crypts is largely responsible for their frequent presence in the lower rectum. It has been pointed out that these lymphomatous growths might be confused with internal hemorrhoids and it seems possible that these occurring in the anal canal might be mistaken for hypertrophied anal papillae. Most important, however, is the possibility of confusing these benign tumors with malignancy and the rather tragic overtreatment which might result.

At the present time there is no existing proof that lymphosarcoma has developed from one of these benign tumors in the anorectum. As a matter of fact, primary lymphosarcoma of the rectum is extremely rare. For this reason a careful study of the tissue involved should be made again and again before arriving at this diagnosis and then an inexhaustible search should be made for the generalized disease before treating it as a local disease.

I recall that Dr. Herbert Hayes read a paper before this Society in 1939 in which he reported the case of a patient who had multiple lymphomas of the colon and rectum. The growths were treated with excision, fulguration and irradiation. I think it would be interesting to hear the outcome of this case.

Benjamin Green (Buffalo, N. Y.): Mr. Chairman, Members and Guests: I am certainly glad of this opportunity to discuss this fine paper and also to listen to the first discussant. We have done some collected case studies over the past fourteen years. When I say "we," I am associated with Dr. Lester S. Knapp, of Buffalo. We have collected fourteen cases of lymphoma, and that follows rather in line with the general impression that these tumors are not as uncommon as was previously believed.

The reports Dr. Sniderman made on his four cases are right in line with the things that we found, namely, that these tumors are almost always pedunculated, either with a short pedicle or with a longer pedicle. I have never been able to find a reported case in which the tumor goes clear around the rectum. I make that point because I am going to compare this

with a very important case in a minute. The tumors are often single; but they may be multiple. In our fourteen cases they averaged over two tumors per patient.

As has been mentioned, there are no definite idiopathic criteria for diagnosis. There may be no complaints and the lymphomas may be discovered incidentally or there may be bleeding or constipation. It may be assumed the whole picture was due to ordinary hemorrhoids and the tumors may be discovered incidentally, with no symptoms whatsoever.

To make the point which I mentioned that these tumors do not ordinarily go clear around the rectum, we had a very interesting patient, a seventy-two year old white female, who presented a picture of constipation, increasing in severity and with some bleeding. She was seen in the tumor clinic and had a tumor which appeared to be somewhat similar to benign lymphoma. However, the lesion was 2 inches long along the lumen of the rectum and the area was distinctly narrowed, which I find to be unusual and practically unheard of in ordinary benign lymphoma. Being alert to the dangers of treating a lymphoma in a radical method, we biopsied this lesion repeatedly. All biopsies were returned with the report "benign lymphoma."

Because of the extent and nature of this lesion, we proceeded to remove a segment of the rectum. It was impossible to do a low anterior resection because of subsequent bleeding at surgery and because of the patient's condition. This stump of the rectum was closed and the peritoneum reconstructed over it, leaving the woman with a colostomy. This was a very undesirable situation in a lesion which was thought to be benign; so at a later operation a Swenson procedure was done with very fair results. However, on examining the complete specimen, together with the tissue back of the rectum, this lesion was found to include the glands of Gerota—obviously not a benign lymphoma. The report then of reticulum cell lymphosarcoma of the rectum came back. The point I wish to stress is that we recognize this entity and that we realize that there must be a very close transition between benign lesions and early malignant lesions of the rectum.

# PROCTALGIA FUGAX

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PROCTALGIA fugax is a well defined symptom complex of obscure etiology and pathology which is characterized by sudden and irregularly intermittent attacks of intense pain of short duration occurring in the region of the internal anal sphincter and the anorectal ring.

Prior to 1917, the year of publication of MacLennan's[1] article, the ailment was regarded as a poorly delineated form of intestinal neuralgia and was not recognized as a separate disorder. This article, however, attracted meager attention, probably because of its lack of sharp detail, and in years following a number of authors, obviously unaware of each other's or of MacLennan's work, described the salient features of the syndrome.

In 1935 in a treatise Thaysen[2,3] coined the term proctalgia fugax (fleeting rectal pain) for a condition to which he could find no reference and therefore thought unknown. In 1936 he further amplified the subject. His precise and graphic portrayal of symptoms delimited proctalgia fugax from its confusing background and precipitated a flurry of case reports and articles by other authors. Consequently, Thaysen is often credited with the original description of the syndrome. The term which he devised has since been adopted into common usage.

Lauda, also under the false impression that the ailment had not been previously discovered, published an article in 1939 as original;[4] however, in an addendum[5] he acknowledged that both he and Thaysen had described the same malady and credited Thaysen with priority.

An essay by Elsner,[6] printed in 1922, and the articles by Japha[7] and Mende[8] which it stimulated have been entirely overlooked. As far as can be ascertained, this is the first reference to them in the literature. Elsner depicted a syndrome practically identical with that later called proctalgia fugax. He advanced the theory the condition was " . . . not a neuralgia but a state of cramp of different perineal muscles, the internal sphincter and others." Japha disagreed that the cause was a perineal cramp and stated, "The site of the disease is in the rectum only and probably within the internal anal sphincter." He was the first to note a possible relationship to migraine and the first to record a familial incidence. Mende, having suffered with the illness as a young man, described his symptoms under the heading "Sphincter Ani Cramp" because he erroneously believed the site of origin to be the external sphincter ani.

This unique and peculiar symptom-complex although generally overlooked is well established and deserves consideration in the evaluation and differentiation of all types of anorectal pain.

*Incidence.* The incidence of proctalgia fugax is difficult to determine. We subscribe to the opinion that the condition is one with which many physicians are unfamiliar and that although uncommon it is not as rare as ordinarily supposed. To date more than 125 cases have been reported. Most of these have occurred in adults, usually males aged thirty to fifty. Interestingly enough, physicians comprise a large percentage of its victims but this is undoubtedly due to fortuitous circumstances. The oldest patients have been in their seventies, with only a few patients below the age of twenty. Roholm[9] reported the case of a fifty year old male who had been afflicted since the age of seven. Thiele,[10] regarding the causative factor as infection in the genitourinary and anal regions, expressed the view that the low incidence of proctalgia fugax in children was due to the fact that " . . . they have not lived long enough to contract acute, subacute, or chronic infections in the sites mentioned." Perhaps another important factor is the difficulty encountered in eliciting an accurate history from children.

*Etiology.* There is no unanimity of opinion as to the etiology of proctalgia fugax. Numerous causes have been proposed (neuralgia, neurosis, infection, allergy, vasospasm, venous stasis, mechanical factors) but none can be supported by conclusive evidence. Attempts to construe the pain as being of a referred type have not been substantiated inasmuch as involvement of any organ other than the rectum

has never been proved. The early writers and Lauda as well believed the underlying cause to be neuralgia. Lauda conceived the ingenious idea that the motion of scybala lodged behind rectal mucosal folds might cause the pain, but this apparently is not so as the stools are usually normal. MacLennan, Thaysen and Ryle[11,12] believed that the disease was a neurosis, but many authors including Thaysen himself asserted that their patients were not of a neurotic temperament. Thiele stated that it was due to infection, yet most patients with infection do not have the disease while only a few who have the disease have infection. Rosser[13] was of the opinion that the pain was caused by intussusception of the sigmoid into the rectum but this seems improbable because there is an absence of symptoms expected in bowel obstruction and it is unlikely that in every case the intussusception would reduce spontaneously.

The fact that hemorrhoids, symptomatic or otherwise, are commonly present has been interpreted as indicating that venous stasis may be a predisposing factor. Many patients, however, have no hemorrhoids. Furthermore, their presence in association with proctalgia fugax is not surprising when their frequency of occurrence is considered.

Included in the cases reported in the literature are instances of the syndrome occurring in consanguineous members of five unrelated families. Not infrequently it has been described in association with "nervous colitis." Occasionally it follows sexual excitement: normal coitus, coitus interruptus, masturbation or nocturnal emission. In a few cases it has been observed to accompany physical fatigue, prolonged sitting or riding, tension states, migraine, epilepsy, menstruation, erythromelalgia, "dead" fingers, muscle cramps, the use of tobacco and pinworm infestation. The multiplicity of these conditions precludes their consideration as more than possible precipitating factors.

There appears to be general agreement that the immediate cause of proctalgia fugax is muscle spasm. The reasoning for this point of view may be summarized as follows: The pain is spastic in nature; it is relieved by the administration of antispasmodic drugs, by means of the pressure exerted by rectal insufflation of air or by use of enemas, by heat and by various positions which the patient may assume in order to stretch the pelvic muscles.

However, there is some difference of opinion as to the exact location of the presumed spasm. The views of Elsner and Japha have already been cited. According to Thaysen the spasm " . . . must be higher up above the anal region, in the rectum or lower sigmoid." Pruitt[14] stated, "Cramp of the levator ani muscle alone could cause this painful phenomenon, though in some cases the coccygeus or other muscles within the pelvis might be involved." Thiele believed that there was acute severe spasm within the levator ani muscle itself whereas in Granet's[15] opinion the spasm was located " . . . in the region of the recto-sigmoid junction."

The external sphincter ani may be excluded as the site of the spasm by absence of the latter during numerous digital examinations performed at the time of acute attacks of the disease. Spasm in the rectosigmoid area does not seem tenable in light of the frequency with which this condition is found on sigmoidoscopic examination in patients who manifest no symptoms of proctalgia fugax. Certainly the immediate vicinity of the internal sphincter and anorectal ring coincides with the clinical area to which most patients limit their pain and is a region in which occasional local physical findings have been demonstrated.

A plausible theory for the pathogenesis of proctalgia fugax can be formulated if its immediate cause is conceded to be muscle spasm in a predisposed individual. The apparent diversity of etiologic factors may then be reconciled by assigning them a role as trigger mechanisms and an analogy drawn to bronchial asthma in which emotional tension, allergy and infection may cause spasm of the bronchial musculature and thus precipitate an attack.

*Symptoms.* The most characteristic and striking feature of proctalgia fugax is the occurrence of pain at the region of the internal anal sphincter and anorectal ring. Cases are recorded in which patients have suffered only a single attack, but more often a number of attacks are repeated unpredictably at irregularly spaced intervals of days, weeks, months and sometimes years. An attack may occur at any time of day or night, often awakening the patient from a sound sleep. There is no disturbance of gastrointestinal function either preceding or subsequent to it, nor is there any impairment of the patient's general state of health. Abortive attacks are not unusual and

in many instances the illness is self-limited, the attacks diminishing in frequency and eventually terminating of their own accord. The pain has been described as cramping, gnawing, aching, expanding, impaling or boring. Females have likened it to labor pain but it differs in that it usually has a brief increment, a relatively long acme and an intermediate decrement. It does not radiate and is not associated with any change in cutaneous sensibility. It tends to recur at the same site in the individual patient but the area involved may differ somewhat from patient to patient. The duration of the pain is variable. It commonly lasts from one to fifteen minutes, occasionally up to thirty minutes and seldom an hour. The onset of an attack is usually sudden although occasionally there is a premonitory sense of mounting tension in the rectum. In a matter of a few moments to a few minutes the pain reaches its peak and at this point may be of such agonizing proportion that the patient twists and writhes with it or, in the exceptional case, remains perfectly quiet in order to avoid causing an exacerbation. Concomitant symptoms such as slight substernal or epigastric tightness, a rapid feeble pulse, profuse perspiration, pallor or momentary loss of consciousness may occur. Priapism and inability to void have been noted but are uncommon. Some patients are relieved by defecation or by the expulsion of flatus during an attack but most are unable to accomplish this despite the feeling that the pain would be ameliorated. Firm pressure over the perineum may abate an attack and a few patients are able to abort one by such changes in posture as hopping or squatting. The acuity of the pain gradually decreases until it vanishes and in its wake the patient is left entirely symptom-free except for a sense of relief and lassitude.

*Physical Findings.* Local physical findings are remarkable chiefly by their absence and inconstancy. The relative frequency with which hemorrhoids occur has been noted. Other common but unrelated anorectal conditions, for example, fissure-in-ano and pruritus ani, also have occasionally been demonstrated. Examinations performed immediately after, or in periods between, attacks of the disease have revealed no unusual abnormalities. An interesting exception is Smith's[16] patient in whom " . . . the muscular wall of the anal canal seemed to grasp the finger tightly, and when the finger tip touched the fibers of the levator ani surrounding it the patient said, 'that is the spot where I get the pain.' " Digital examinations during attacks have been carried out on a large number of the patients, many by physicians on themselves. In several cases tender, dilated veins were said to have been palpable. In one, finger pressure on an area of "intense soreness to the left of the prostate"[17] stopped an attack, but in the vast majority no significant changes were disclosed. Because of the inopportune, unpredictable and transitory nature of these spells endoscopic study during them has been done in only three cases. MacLennan in a scanty description observed that in two patients there was " . . . a fine fibrillary tremor in the internal sphincter." In Bolen's[18] case sigmoidoscopy revealed an edematous, reddened rectal mucosa, an abnormally rounded middle valve of Houston and pain on pressure at the central portion of the levator ani.

*Diagnosis.* Diagnosis is ordinarily not difficult if the condition is kept in mind and included in the differential diagnoses. In the last analysis it rests upon obtaining a carefully detailed history of the subjective symptoms. Nevertheless, minimal study in all patients suspected of having the condition should include a complete physical examination, a serologic test for syphilis and local evaluation by inspection, digital examination, anascopy and sigmoidoscopy. These procedures, often combined with examination of the genitourinary tract, barium enema and x-rays of the lumbosacrococcygeal spine will enable the physician to rule out other forms of rectal pain simulating proctalgia fugax.

Among the conditions to be differentiated are rectal neuralgia, tabetic rectal crises, coccygodynia, the rectal aura of epilepsy, fissure-in-ano, fecal impaction, foreign bodies and tumors of the rectum, prostatitis, seminal vesiculitis, ovarian or uterine tumors and tumors of the spinal column or cord. Of these the first three are apt to be confusing. In rectal neuralgia the pain persists hours to days, is of a burning or smarting nature, radiates from the rectum to the perineum, sacral region or genitalia and may be accompanied with paresthesia or hyperesthesia. The pain or rectal tabetic crises is usually hours in duration, the complement-fixation test is positive and abnormal neurologic findings are present. In coccygodynia the pain which is centered about

the coccyx lasts longer, may radiate to the supragluteal area or down the back of the thigh, is often aggravated by movement of the coccyx and is associated with sensitive areas in and palpable spasm of the levator ani, pyriformis or coccygeus muscles.

### TREATMENT

Prophylactic measures consist of the isolation and elimination when possible of factors suspected of precipitating attacks, for example, prolonged sitting or riding, constipation or "nervous colitis." The avoidance of allergens and the use of antiallergic drugs are inadequately tested procedures and are probably of doubtful efficacy. Eradication of foci of infection in the anorectal or genitourinary regions is indicated, but discretion must be exercised in prognosticating beneficial effects on the course of the disease. Psychotherapy although not curative is of value in adjusting the patient to his illness. Cancerophobia is common in patients subject to proctalgia fugax and, therefore, after adequate study it is important to reassure them that the disease is neither caused by, nor will lead to, malignancy.

A hot Sitz bath, warm water enema or the application of firm pressure or heat to the perineum or sacrum sometimes moderates the intensity of the pain. In the hope of abating an attack patients may be advised to assume a completely doubled up squatting position with fingertips touching the floor or an exaggerated knee-chest position. Suppositories are poor therapeutic agents since their active ingredients are slowly released and absorbed. Analgesics may be useful but morphine is indicated only when a shock-like state supervenes.

The most efficient therapy for the acute pain is the administration of antispasmodic drugs. MacLennan recommended the inhalation of chloroform prepared in the form of 3 minim chloroform vaporoles. Lauda prescribed caffeine, 2 to 3 gr. daily, apparently with some benefit. Oderr's[19] patient obtained instantaneous relief from the use of a benzedrine inhaler. The nitrites, particularly amyl nitrite by inhalation, have been used extensively with excellent results. Granet suggested the use of tablets of nitroglycerine. The soluble tablet, $\frac{1}{100}$ gr. or $\frac{1}{200}$ gr., may be placed under the tongue and repeated if necessary. This method of employing a nitrite is simple, convenient, rapid and very often effectively aborts or modifies an attack.

### CASE REPORTS

The following cases illustrate many of the clinical aspects of the syndrome. For the sake of brevity irrelevant material has been omitted. A general physical examination including routine blood study and urinalysis, a Wassermann test and digital, anoscopic and sigmoidoscopic examinations were performed on each patient. All patients received psychotherapy. Nitroglycerine when advised was prescribed in the manner already outlined.

CASE I. J. L. K., a male physician aged forty-four, had always enjoyed good health except for attacks of rectal pain since the age of twenty. The attacks, which were sometimes abortive, numbered from five to twelve yearly and always occurred early in the morning. The closest interval between them was several weeks although on one occasion two occured in one week. The pain was always located at the same site, 2 to 3 inches above the anus, and usually was from fifteen to twenty minutes in duration. Its onset was sudden with a desire of "wanting to go to the toilet." In thirty seconds it reached a peak and caused a sensation of intense but dull pressure "as though something were going to burst," following which it gradually disappeared. Although the urge to pass flatus or have a bowel movement was not present, there was the feeling that if this were possible relief might ensue. On examination moderately enlarged internal hemorrhoids were detected. Nitroglycerine was prescribed but the patient did not take the drug as directed because he desired to be certain that a particular attack was not an abortive one. Six attacks occurred after the use of the drug had been advised. One, for which no medication was taken, ran a typical course. During the others the patient waited until the attacks were well developed before he took the nitroglycerine, but in spite of this its use brought relief in a few moments in every case. The patient believed that the effect of the drug was "remarkable and spectacular."

CASE II. N. P., a fifty-six year old male, was seen in consultation in 1948. The past history revealed the following: gonorrhea at the age of eighteen complicated by chordee and epididymitis, urticaria, bronchial asthma and bronchiectasis, all of long-standing and undetermined etiology. The patient complained of

numerous attacks of paroxysmal rectal pain which had occurred intermittently for the past sixteen years. These were unrelated to his allergic symptoms, usually awakened him from sleep, always remained localized 2 to 3 inches proximal to the anus and invariably persisted for about fifteen minutes. The patient described the pain as "screwing" in type. The onset of an attack was sudden; and although the pain seemed to wax and wane, it reached its greatest severity in about three minutes. At this point profuse perspiration, pallor, nausea and faintness occurred. Gradually the pain diminished to a moderate level and then suddenly disappeared. An attack could often be modified by squatting or by a position of complete flexion. On examination a few internal hemorrhoids were detected. Two prostatic smears and x-rays of the pelvis and lumbosacrococcygeal spine were within normal limits. Nitroglycerine completely aborted six subsequent attacks.

Case III. In October, 1949, M. B., a forty-two year old female, complained of a bout of severe rectal pain. Her past history was negative except for an appendectomy in 1935 and a supravaginal hysterectomy and bilateral salpingo-oophorectomy in 1937 for "uterine fibroids and inflamed ovaries." She had been in excellent health and symptom-free until four days earlier. At that time after a normal bowel movement but while still sitting on the commode she noted a sense of discomfort in the rectum about 2 to 3 inches above the anus. The discomfort rapidly gave way to intense "boring" pain associated with weakness and profuse perspiration. During the attack there was no distress in the chest or epigastrium. The patient was unable to state whether or not there was accompanying pallor. She walked about restlessly and could not expel flatus despite the feeling that this would bring relief. The attack lasted approximately five to seven minutes and terminated suddenly. She had remained symptomless since but on questioning admitted considerable fear of cancer. Examination disclosed the presence of healthy healed surgical scars, a few small internal hemorrhoids and slight redundancy and venous engorgement of the rectal mucosa. Therapy consisted of explanation and reassurance. There has been no recurrence to date.

Case IV. J. C., a thirty year old female, otherwise healthy, was first seen in March, 1949, at which time she complained of having suffered eight to ten attacks of rectal pain which had occurred at long and varied intervals over a period of eight years. The pain always came on in the evening after she had been tired and nervous and while in bed. It began mildly in an area of the bowel proximal to the anal orifice and seemed to spread around the circumference of the bowel. It became progressively more severe until it reached a peak, and at this point the patient became nauseated; on one occasion while attempting to arise she fainted. As a result she had avoided trying to get out of bed during an attack for fear of falling. The duration of the pain was five to ten minutes although on one occasion it lasted twenty minutes. Hot compresses seemed to relieve it somewhat. Only a few small internal hemorrhoids were found. A single hemorrhoid was injected with 1 cc. of a 5 per cent solution of phenol in cotton seed oil. She has had two attacks since, each being quickly aborted by nitroglycerine.

Case V. R. M., a fifty year old male, was referred for consultation in 1949 because of recurrent attacks of rectal pain occurring about every six months during the past year. The attacks always awakened him from a sound sleep and at first imparted a sensation "of heavy pressure" in the lower rectum above the anal orifice. In a few minutes the pain would become intense "like a dull sword inserted into the rectum." On each occasion the passage of flatus and a normal stool terminated the attack which lasted ten to fifteen minutes. Examination revealed moderately enlarged internal hemorrhoids. A course of injections of 5 per cent phenol in cotton seed oil was given. The attacks have not recurred.

Case VI. M. R., a fifty-one year old female, underwent a uterine polypectomy in 1944. Two years later she was treated for uterine fibroids by irradiation. In 1949 she was found to have a few internal hemorrhoids and an external thrombotic hemorrhoid. After treatment of the latter she returned for a series of injections of her internal hemorrhoids, 5 per cent phenol in cotton seed oil being used. At that time she complained of attacks of rectal pain, the last of which had occurred three months previously. The attacks had begun in childhood and she had suffered six since their onset. All of them occurred at night awakening her from a sound sleep. The pain, which was located in the "interior of the rectum" a short distance above the

anal orifice, began suddenly, soon reached a height of great intensity and then gradually disappeared. Usually it lasted about five minutes. During each attack there was an urge to defecate although the patient was unable to do so. On several occasions while a hemorrhoid was being injected discomfort was caused which was very similar to that suffered at the onset of an attack. Nitroglycerine was prescribed. There has been no recurrence.

Case vii. R. C., a thirty year old male, had suffered with bouts of rectal pain since the age of fourteen. He was seen in consultation in May, 1948, and stated that in the preceding year he had had three attacks. Usually, but not always, they took place at night awakening him from a sound sleep. Frequently they were associated with an erection or a desire to have a bowel movement. Most attacks lasted ten to fifteen minutes but one lasted twenty-five minutes. The pain was located "just inside" the anus. At first it was mild but it quickly became maximal and persisted so until it gradually abated. The patient had learned to ease the pain and sometimes abort it by lying flat on his back with his lower extremities in a completely flexed position. Except for moderately enlarged internal hemorrhoids the examination was negative. A course of injections with 5 per cent phenol in cotton seed oil was given. Nitroglycerine resulted in the relief of two subsequent attacks.

Case viii. F. O., a fifty-six year old male, sought treatment in March, 1948, because of a single attack of severe rectal pain which had occurred three days earlier. He had been awakened at night by severe pain in his rectum which rapidly intensified and made him feel faint. It was located about 2 to 3 inches above the anus. In five to ten minutes it gradually diminished and then completely disappeared. Only a few moderately enlarged hemorrhoids were found. A course of injections with 5 per cent phenol in cotton seed oil was given. Nitroglycerine was advised but there has been no recurrence.

Case ix. R. D., a fifty year old female, had her left leg amputated at the age of twenty-five because of tuberculosis of the bones of the ankle. In 1924 a fistulectomy was performed for a tuberculous fistula-in-ano. Three months later she began to suffer with attacks of rectal pain which continued sporadically until the time of consultation in October, 1949. The attacks, which were without known cause, always occurred at night awakening her from a sound sleep. The shortest interval between the attacks was two months and the longest was four months. The pain, which was localized to the vicinity of the internal sphincter ani muscle, usually lasted about twenty minutes. It began suddenly, soon reached an almost unbearable point and then gradually disappeared. At its greatest intensity the patient remained absolutely quiet for fear of aggravating it, and after its disappearance she felt exhausted. Examination revealed healthy surgical scars, an internal hemorrhoid and a small, insignificant external thrombotic hemorrhoid. Nitroglycerine produced "remarkable relief." Each of three subsequent attacks completely disappeared in a few moments to minutes after use of the drug.

Case x. M. C., a forty-seven year old female, underwent an unsuccessful cauterization and dilation of the external sphincter ani in 1939 for fissure-in-ano. In 1948 she underwent excision of a fistula and fissure-in-ano, a hemorrhoidectomy and a posterior sphincterotomy. Several months later a supravaginal hysterectomy was performed because of fibroids. Shortly thereafter the patient noted the onset of attacks of rectal pain which were located between the lower rectum and the anus. The attacks took place only at night. The pain, which was quite severe from the start, increased until it reached an apex and then gradually subsided. At its peak she had the urge to have a bowel movement but was never able to do so. She had suffered about five attacks, each lasting approximately five to ten minutes. Healed surgical scars were present but the examination was otherwise negative. Nitroglycerine diminished the intensity but did not obviate the pain of the only attack suffered since consultation in December, 1949.

Case xi. J. S., a sixty-three year old male, was found to have moderately enlarged internal hemorrhoids. Therapy consisted of a series of injections with 5 per cent phenol in cotton seed oil, the first of which was given in August, 1948. In December while the patient was seated in the office awaiting an injection treatment a sudden, severe, cramping pain developed "inside the rectum" 2 inches above the anus. It was associated with a marked desire to defecate and with pronounced pallor, weakness and profuse perspiration. The patient was able to stagger to the toilet where he had a

normal but malodorous bowel movement, the passage of which terminated the pain. The entire incident took about five minutes. Questioning revealed that about two months earlier while in the office awaiting injection therapy a similar attack had occurred and that one month earlier while at work he had suffered an attack which differed only in that he was unable to have a bowel movement although the urge to do so was present. Re-examination disclosed no new findings. No other attacks have occurred.

CASE XII. F. W., a forty-eight year old male, was referred for consultation in 1950 with a tentative diagnosis of proctalgia fugax. At the age of twenty intermittent attacks of paroxysmal rectal pain and pruritus ani developed which were diagnosed as psychogenic in origin after study at several hospitals. The attacks of pain had averaged from ten to twelve yearly occurring at intervals of one week to three months. The majority were unrelated to any known cause, but shortly after their onset he had noted that one invariably followed within half an hour after marital relationship in the usual position. Intercourse in the reverse position did not produce an attack. The onset of the pain was always sudden and in each instance occurred at the same site about 1 inch above the anal orifice. It rapidly assumed an agonizing proportion and terminated relatively slowly lasting fifteen to thirty minutes. The type of pain was similar to that which might be felt "if the hand was grasped and squeezed very tightly." Each attack was associated with chilliness, perspiration and an erection, and on three occasions the patient had fallen unconscious for an undetermined period. Defecation or the expulsion of flatus gave no relief. Forceful flexion of the thighs on the abdomen often diminished the acuity of the pain and shortened the duration of an attack, but frequently on extending the thighs the pain would recur. Physical examination revealed small external and internal hemorrhoids and pruritus ani. X-rays of the lumbosacrococcygeal spine were within normal limits. Urologic examination revealed no evidence of disease. Within a month after having been seen in consultation the patient suffered three attacks of pain. With the onset of each he took nitroglycerine and noted that "it gave relief instantly in less than a minute."

SUMMARY

Proctalgia fugax is a distinct clinical syndrome of unknown etiology probably caused by spasm of either the internal anal sphincter or the anorectal ring or both. It is characterized by attacks of severe paroxysmal pain localized to the region of these muscles and may be associated with concomitant symptoms such as precordial pressure, pallor, profuse perspiration and transient syncope.

A brief review of its evolution as a clinical entity and a theory for its pathogenesis have been presented.

Nitroglycerine administered sublingually at the onset of pain will abort an attack in many instances.

The disorder although relatively rare is probably encountered more frequently than supposed and should be included in the differential diagnosis of anorectal pain.

Twelve new cases demonstrating various clinical aspects of proctalgia fugax are reported.

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#### DISCUSSION

Emil Granet (New York, N. Y.): You must agree with me that this presentation of Drs. Angelo and Karras in its complete coverage of historical and clinical data, discussion of probable etiologic factors and recital of illustrative cases leaves meager pickings for the discussers. My remarks will be limited to one aspect of the problem, the pain mechanism.

As you have heard, many theories have been propounded to explain the mechanism of pain in this syndrome. The authors quoted the opinion of Curtice Rosser that the proctalgia occurs in some cases of sigmoidorectal intussusception. However, Drs. Angelo and Karras believed that this mechanism as a cause of proctalgia fugax was improbable. With this I cannot agree. I find, as first pointed out by Dr. Rosser, that in a number of my patients in whom sigmoidorectal procidentia was clearly demonstrated a history of occasional attacks typical of proctalgia fugax was elicited. Primary symptoms in patients with sigmoidorectal intussusception consisted of obstinate constipation, a feeling of incomplete evacuation after defecation, tenesmus and infrequent bloody mucoid dejections. Only after careful questioning was the history of occasional attacks of paroxysmal rectal cramps obtained. Although most attacks occurred nocturnally, a number of patients experienced typical paroxysms directly following an evacuation which had required exceptional expulsive efforts.

Sigmoidorectal intussusception is a common clinical syndrome. We generally fail to diagnose this condition because we ordinarily sigmoidoscope patients in the inverted position. In the inverted patient the force of gravity acting cephalad plus the force of the atmospheric pressure entering through the scope displaces the prolapsed sigmoid into its anatomic position in the proximal pelvis. However, should this patient be sigmoidoscoped in the Sims position and the patient asked to strain down while the scope is being slowly withdrawn, the sigmoid will be seen to descend into the ampulla of the rectum, often reaching to the sphincteric rectum. If digital examination is now performed, the apex of the sigmoidal intussusceptum is palpable. It feels like a firm knuckle of intestine and pressure thereon elicits pain which the patient localizes in the same area as suffered during a paroxysm of rectal proctalgia.

What Bolen saw through the scope in his often quoted case was probably the apex of a sigmoidal intussusceptum which reduced itself during sigmoidoscopy thereby allowing the

passage of gas, relief of pain and subsequent observation of a normal-appearing sigmoid.

It is possible that in certain patients with sigmoidorectal procidentia on occasion the intussusceptum descends to the sphincteric rectum in which position its apex lies between the limbs of the powerful puborectalis muscle. Should paroxysmal spasm of the levator now occur, the apex of the sigmoidal intussusceptum becomes incarcerated between the opposed limbs of the puborectalis to result in the agonizing cramp of proctalgia fugax. Physiologic fatigue and subsequent relaxation of the muscle spasm allowed the crushed sigmoidal intussusceptum to escape, with subsequent relief of pain.

In reviewing my cases I found that proctalgia fugax occurred in eight (35 per cent) of twenty-three recent cases of sigmoidorectal procidentia. I must point out that this theoretic explanation applies only to this phase of the problem.

GEORGE H. THIELE (Kansas City, Mo.): I find myself unable to disagree with anything that has been said either by the authors or by the discussor. I disagree with some of the quoted opinions which they have mentioned.

In the first place, when one says that a pain is due to neuralgia, he is merely saying that pain is due to pain of a particular type. Such a remark of course does not make sense. Neuralgia is defined by Dorland as "pain in a nerve or nerves, or radiating along the course of a nerve." It "is of a severe darting or throbbing character, intermittent, and is attended by sensitiveness of the skin and the presence of tender points where the cutaneous branches of the nerve are given off from the deeper parts."

It is evident, therefore, that the syndrome described as proctalgia fugax does not fulfill Dorland's definition of neuralgia.

I do not believe that there is any doubt that the rectosigmoid pain described can be due to spasm of the rectosigmoid after intussusception of the sigmoid into the rectal ampulla has occurred. I cannot agree with Doctor Granet, however, that the intussusceptum can be squeezed by bilateral spasm of the pubococcygeal portions of the levators. I have observed two or three patients with this severe type of rectosigmoid pain in whom immediate relief was obtained by assuming the inverted position. All of us have observed patients during sigmoidoscopy who could prolapse the sigmoid into the rectum by straining. This is so easily done as to be considered almost normal.

Dr. Raymond Murdoch brought forth this very idea of intussusception as an explanation of severe colicky pain in babies referred to him by pediatricians, and he has satisfactorily proven to himself that intussusception of the sigmoid into the rectum was the etiologic factor responsible for this severe low abdominal pain in some of the infants he has seen.

The pain of proctalgia fugax is described as agonizing, and it certainly is agonizing. To try to describe it a little more accurately, one might compare it to the severe agonizing pain of a cramp in the plantar portion of the foot which occurs at night. It should be noted that when the spasm relaxes, the pain disappears.

Then there is another type of pain which seems to me to simulate proctalgia fugax. I refer to the pain incident to the rupture of one of the small veins in the palm of the hand. It seems to me that the severe pain experienced after hard straining with defecation might easily and properly be explained by rupture of a small vessel in the levator ani.

WILLARD H. BERNHOFT (Buffalo, N. Y.): I would like to go on record as agreeing with the discussers that this is a colorectal invagination. As a matter of fact, I would like to make a plea for dispensing with the term proctalgia fugax because the term does not describe anything other than a pain that is somewhere in the back or rectum. It is the first stage of a rectal prolapse, if you will, or sigmoidal prolapse and it does occur in children. You will see it in youngsters with bloody diarrhea and if they are examined during that time, as Dr. Thiele mentioned, youngsters with colic, you will find in the rectosigmoid area distinct injection of the mucosa where there has been bleeding. That is definitely the same type of condition that exists in adults when they are taken with severe lower quadrant pain and tenesmus. I think that if we use the words colorectal invagination or sigmoidorectal intussusception it is more descriptive than the term as given this morning.

JULIUS GERENDASY (Elizabeth, N. J.): I would just like to ask one question. You all know that there is no pain in the rectum itself. There is a sense of pressure. Pain is always in the sphincter area. How do you explain this pain that is coming from a rectal pathologic condition?

NEIL W. SWINTON (Boston, Mass.): I wish

to comment on this paper briefly. We see at the Clinic each year quite a number of patients with symptoms very similar to those described by Dr. Angelo. I rarely use the term "proctalgia fugax" but classify these cases as "pain, rectal, etiology unknown." In many instances we are uncertain as to the cause of this pain.

We have recently had one case of unusual interest, a school teacher of forty-five with intermittent, severe pain similar to that already described which would awaken her in the middle of the night, occur during a class and at almost any time. This patient was a highly intelligent individual and certainly not a neurotic person in any respect. She had an extensive study by us and was seen on several occasions over a period of months. The pain was so severe that she was quite desperate. It was the suggestion of our neurosurgical service that she be explored with the possibility that she had a benign tumor of the scaral plexus. At exploration no pathologic disorder of the sacral plexus could be found. Explorations of the abdomen and pelvis were entirely negative. A presacral neurectomy was performed at the time of laparotomy. The patient has been completely relieved of her pain ever since. I am not advocating that a presacral neurectomy be performed under ordinary circumstances for pain of this type, but I do wish to make the point that before the diagnosis of proctalgia fugax is accepted complete medical, neurological and, if necessary, other special examinations be carried out on these patients before a diagnosis of "rectal pain, etiology unknown," is accepted.

Edward T. Whitney (Boston, Mass.): As Dr. Thiele suggested, this condition is very comparable to common, ordinary cramps in the legs or feet. Many years ago we had a great deal of experience with vascular conditions of the legs and a common complaint of the patients was cramps. Somewhere we ran into a little squib in some of the medical literature that the condition was caused by an imbalance between calcium and phosphorus metabolism, and the treatment was simply getting the patient back onto a normal amount of calcium through milk and a normal amount of phosphorus through eating some whole wheat. This treatment would bring on prophylaxis in a month or six weeks.

Then, we ran into another little squib somewhere that if you feed 5 gr. of quinine to these people you immediately have prophylaxis. We put these two forms of prophylaxis together and as far as I know we never had any complaints after that.

In transferring our interest to rectal work we applied the same form of prophylaxis to this condition of proctalgia fugax and, again, so far as I know, we have never had any failures.

Gaspar Angelo (closing): I am delighted that the discussers were so kind and I wish to thank them.

In all the cases reported, as well as in our twelve cases, repeated examinations in various positions failed to reveal evidence of intussusception. This includes the only three cases that were ever examined by sigmoidoscopy during an attack. The theory we proposed is simply a working theory devised to find a common denominator for the diverse conditions reported as associated with or causing the syndrome.

Dr. Thiele, our use of the term "rectal neuralgia" was simply a quotation from the literature.

Dr. Gerendasy, we believe pain may definitely occur in muscle spasm and believe that this explains the pain in proctalgia fugax.

Dr. Whitney, the prophylactic use of quinine would be almost impossible to evaluate because of the unpredictable time intervals between attacks.

# THE ROLE OF THE ARTERIES AND OF POSTURE IN HEMORRHOIDS

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*San Antonio, Texas*

OF the many factors involved in the etiology of hemorrhoids two are rarely mentioned. One factor seldom discussed and little investigated is the role played by variations in the arterial supply peculiar to this anatomic area. Another is the role of faulty posture in the development of hemorrhoids.

Oversupply of arterial blood and the thin capillary bed is responsible in the early adult years for potential and early hemorrhoids, especially of the familial type. Posture influences the relaxation of middle age and older life and is of importance in the production and control of symptoms in advanced hemorrhoids.

A discussion of the causes of hemorrhoidal development must of necessity be almost pure theory based on personal observations and not easily proven by scientific means. I am presenting my observations in the hope that you may prove or disprove my theories by scientific studies of your own. I am sure my comments are not unique but these phases of the subject have seldom been discussed in literature.

Much has been made of venous back pressure caused by upright position of man and the lack of valves in the veins draining this area. Much research has been done on both the gross and microscopic anatomy of the veins draining the anus and rectum. Reuther's[1] studies on this subject were truly scientific and thorough. Little mention has been made of the oversupply of arterial blood to this area in many people, or of the meager capillary bed through which this arterial blood drains into the poorly supported surface veins.

I believe that in many people the anorectal circulation almost amounts to a series of miniature arteriovenous aneurysms and that the local venous pressure tends to increase because of partial breakdown of the thin capillary bed. This would explain the relief often noted following a bleeding spell with a possible return of the local venous pressure to normal. This also would account for the familial tendency toward early development of hemorrhoids seen in some families. Some families have big ears; some have a big arterial supply to the hemorrhoidal area; this represents "potential hemorrhoids."

In many of the discrete, acute, thrombosed external hemorrhoids, so frequently seen in younger people following a sudden undue strain, the clot is found in a vein. This could be caused by a sudden complete breakdown of the capillary dam with sudden arterial tension in the local vein and a stretching of the intima. Damage to the intima could account for both the thrombosis and the sudden acute episode of pain before skin pain occurs. Skin pain is said to be produced by the edema and stretching of the cutaneous nerve endings.

People with arterial hypertension frequently have hemorrhoids of the full bleeding type with active rather than passive congestion and without much of the fibrosis and redundency seen in people subject to conditions causing venous back pressure. The hemorrhoids that develop in arterial hypertension are very similar to newly developed hemorrhoids in the young. Grossly the oversupply of spurting arteries is far more noticeable than the presence of large dilated veins. Just as coronary or liver blockage may result in hemorrhoidal recurrence, arterial hypertension may also cause recurrence. Just as the hemorrhoids may serve as a safety valve and bleed in conditions causing back pressure, they may also bleed as a safety valve in hypertension.

In a study of the living anatomy of the hemorrhoidal area at operation it is often easy to predict the location of the spurting arteries to be encountered. In full internal hemorrhoids with most of the arterial supply from the superior hemorrhoidal branches the spurters will be encountered at the upper pole just below where the arteries approach the mucosa to form the hemorrhoidal area. A suture above these bleeders will control them, the depth of the suture depending on how high the hemorrhoid is excised. In full mixed hemorrhoids, ex-

terno-internal fullness or the "anal hemorrhoids" described by Buie[3] spurters will also be encountered, coming probably from the middle hemorrhoidal branches, directly through the underlying levator and sphincter muscle fibers. These bleeders can be controlled by direct ligation or suture. In full external hemorrhoids the spurters will be seen coming from the pudenal artery straight through the anal sphincter or external to it. These bleeders can also be controlled by a ligature or suture directly over this area.

It is easy to demonstrate the thinness of the capillary bed here. I have frequently demonstrated it several times in a single hemorrhoidectomy. When the bed of veins under the mucosa next to the muscle is excised, often a single bud of veins the size of a match head or less is seen. If this small bud of veins is picked up and excised, a spurting artery is almost always encountered directly under it. Numerous authors believe that any veins left *in situ* will increase and multiply to form new hemorrhoids. Tom Smith[2] even fulgurates the muscle bed under the excised hemorrhoids to destroy all possible endothelial tissue and prevent recurrence.

Some of our best men pride themselves on not cutting arteries and not having to ligate or suture bleeders. The avoidance of suturing muscle definitely must reduce after pain but to me the important objective is to prevent recurrence. I believe that the more arteries cut and ligated or sutured the less chance for a return of the hemorrhoids. Hemorrhoids are doubtless mostly venous, but I believe that the veins are just passive injured bystanders and that their removal alone will not prevent recurrence. That could explain why injection treatments do so much temporary good but are seldom permanent. The scar from the injections shrinks the veins but not the arteries so the veins reform and redistend.

Mention has been made in the literature of the rarity of purely arterial hemorrhoids and capillary hemorrhoids. Often during the injection of hemorrhoids the needle severs an artery in the mucosa that will spurt, but I have seen only one patient in whom one of the masses seemed mostly arterial. This man had a polyp near the splenic flexure, diverticulosis and recurrent hemorrhoids. His hemorrhoidal bleeding required temporary control by injections. In one hemorrhoid the injections did not control the bleeding well and on two occasions the needle severed arteries in this mass that required ligation by suture.

Buie[3] and Malmgren did some excellent work on the microscopic study of the vessels in excised hemorrhoids. They concluded that the arteries were not at fault since the arteries showed no apparent abnormality. They also encountered no capillary hemorrhoids. They stressed the factor of infection in the production of hemorrhoids and produced good evidence to prove the importance of infection. Bacon[4] also stresses the importance of infection in his thorough dissertation on the etiology of hemorrhoids. In discussing heredity as a factor in the etiology Bacon says "By this is meant the structural weakness of vascular tissue. It has been shown by Montague and mentioned by Morley that such a condition is inherited and from general atony of the body tissues or increased blood pressure there results a giving way of the hereditarily weak venous structures."

While the part played by infection has been generally accepted, it has never been proven that increased pressure in the local veins may not cause a stretching and weakening of the intima which may precede the infection and allow the infection to become established. This local increase in venous pressure could be from increased arterial supply and a weak capillary bed or from venous back pressure.

Mr. Gabriel,[5] for one, has noted the importance of oversupply of arterial blood and defects in the capillary bed in the etiology of hemorrhoids. He says, in discussing the importance of heredity especially in familial hemorrhoids: "When well-marked piles are met with in children or in relatively young adults, between the ages of 18 and 30 for instance, it seems reasonable to presume that some congenital factor must be present, such as an abnormally large arterial supply to the internal hemorrhoidal plexus, a structural weakness in the vein walls, or a congenital dilation of the capillary plexus."

It would be interesting to study variations in the hemorrhoidal end-arteries, arterioles, capillary bed and venules by means of models built up from serial sections, such as was done so ably by Malcom Hill[6] and his co-workers in the study of anal glands.

While four-footed animals seldom have hemorrhoids, this malady is said by Rhea[7] to be

not infrequent in dogs, especially in old obese dogs, and their hemorrhoids are at times acutely thrombosed. These hemorrhoids could be due to either back pressure or to increased arterial tension. On the other hand, he has never seen hemorrhoids in monkeys, our partially upright counterparts, although he treats monkeys in a fairly large zoo. This possibly offers us a fertile field for animal experimentation, producing arterial hypertension in some and venous stasis in others.

The role played by posture in the control of protrusion and improvement in sphincter tone is called to our attention often in the postoperative care of anorectal cases. Many postoperative patients have a feeling "that everything is falling out." This can soon be overcome by exercises that strengthen the perineal muscles such as pulling up the perineum and by winking the anal sphincter. Anyone with protrusion due to relaxation can improve the situation by pulling the anus up where it belongs. Contracting the abdominal muscles does not tend to force out the hemorrhoids as pressure from a girdle does. It is hard to compress the abdominal muscles without also tightening the muscles of the perineal floor. This correct posture and the exercises to attain it can best be described in the terms of the old army sergeant's command "suck in them guts."

SUMMARY

The role of the arteries in the production of hemorrhoids is discussed. Conclusions are drawn from observations not unique to this author. The reader is invited to prove or disprove these theories by his own experiments.

Possible lines of approach to answering questions involved are suggested. Attention is briefly called to the roles played by posture in hemorrhoids.

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DISCUSSION

Knox Brittain (Rochester, N.Y.): Surely anyone who undertakes a study of the etiology of hemorrhoids deserves commendation, for any departure from the usual long list of causes stimulates thought. Dr. Tucker has done just this.

Possibly a majority of us have some self-satisfying theory which explains the cause of piles, yet I am of the opinion that the situation today was well described by Tuttle over forty years ago when he wrote: "It seems strange that no definite and accepted theory as to its cause has been accepted." Perhaps the reason for this belief is that in spite of the long list of etiologic factors, such as the upright position, infections, lack of valves, straining, pregnancy, back pressure, etc., each of us sees patients with one or more of these conditions, yet they have no clinical hemorrhoids; at another time we see severe varicosities with no plausible explanation other than possibly the upright position.

I am sure many of Dr. Tucker's observations have been noted by each of us, yet knowing the cause of these phenomena is quite another problem. In any microscopic sections (though I admit no serial sections were made) which I have reviewed, I have not observed abnormalities or apparent involvements of the arteries or arterioles.

Any discussion concerning the superabundance or oversupply of arterial blood to the hemorrhoidal area would in itself excite considerable controversy. Whether there is a difference in the amount of arterial blood supply to this area in people having hemorrhoids and in those without hemorrhoids, I do not know.

As to whether abnormal shunts or aneurysms exist in cases of hemorrhoids might be investigated by methods similar to those described by Gilfillan in *The Archives of Surgery* and Holmes and Lovett in *Gastroenterology*. These investigators injected an opaque medium to the portal system and made roentgenologic studies of the branches. Were one to use a colored and gelatinous opaque mixture, minute dissections of the arteries and veins could be carried out after the x-rays had been made.

Carrying the investigation a bit further, one might utilize patients undergoing surgery for

cancer of the rectum to study the local venous and arterial pressures, oxygen content and carbon dioxide combining power. These two should lend support to or argue against the theory.

Still it seems to me we would not know why such was the case. We all know, for example, the tubercle bacillus is required to produce tuberculosis, yet we also know that not all individuals who inhale or ingest tubercle bacilli develop tuberculosis. Other factors are required.

Is it not possible that some congenital or acquired abnormal condition of the biochemistry, hormones or nutrition is present as a common denominator in individuals who develop hemorrhoids, which result in a loss of the perivascular support or weak blood vessels? Thereafter several different conditions might serve as the exciting or precipitating cause. Such causes might be the upright position, cirrhosis of the liver, pregnancy, infections, constipation, straining, etc.

Dr. Tucker is to be commended for reawakening our interest in a subject which I agree is not entirely satisfactorily explained even today. After all, he is simply urging us to investigate and experiment in an effort to discover an explanation which will be completely satisfactory.

VICTOR C. TUCKER (closing): I want to thank Dr. Brittain for adding to the subject and suggesting a base for further scientific study.

The microscopic study of the vessels is very complicated and must be done by experts in pathology, but you can look at gross anatomic dissections and you will be surprised to note how much variation there is in the arterial supply, even of the pudendal branch alone. The University of Texas Anatomical Laboratory has some very excellent mounted perineal dissections and a study of two or three of those shows the wide variation in the arterial supply. There used to be a specimen (I guess it is still there) at the Mayo Clinic of a rectum in which everything has been digested out except the arterial and venous supply. That method would also form a very excellent means of comparison.

I sent copies of this paper to each author quoted so they could bring their ideas up-to-date, if they wished, because some of the quotations were from articles written some years ago. I also sent copies to some of my friends, and I want to quote from two of the replies.

One is from Dr. Theodore F. Reuther of San Leandro, California, who did the work with Bacon on the microscopic study of the anorectal veins and their valves. He made some very interesting suggestions on the possibility of the study of arteriovenous shunts in this area by the use of serial sections stained by the differential method of Bodain or Masson. He says: "I, too, believe that there is more in the theory of causation of hemorrhoids than just the usual ones of venous stasis due to obstruction and position and congenital weakness of walls. It would be interesting, as you suggest in your paper, if someone made magnified reconstructions from serial sections of the anal area which would show not only the nerves and endings but also the vessels and the arteriovenous anastomoses. It could be done with the stains mentioned or some other method such as that of Masson. I am sure such studies would help in your research in the etiologic factors of hemorrhoids, aside from the usual beliefs of stasis, infection, etc. I hope it could be possible to interest some one in such work. It would make a good thesis for an embryo proctologist if good laboratory facilities were available."

Mr. Gabriel was also kind enough to read my paper and give his ideas. He says: "I am sure you are right in stressing the importance of an abnormally active or massive arterial supply to the internal hemorrhoidal plexus. I still believe that a congenital enlargement of one or more of the terminal branches of the superior hemorrhoidal artery must be the usual explanation of large internal hemorrhoids when they occur in young subjects. For instance, I have just lately seen a young man aged 18 with rectal bleeding, who, when examined in the left lateral position and asked to strain down into a proctoscope, produced a very large vascular pile in the right anterior quadrant and a thin stream of arterial blood shot out across the floor to a measured distance of four and one-half feet. This was a good evidence of the arterial factor in the production of his hemorrhoid.

"I should also like to call your attention to one other sentence in my book under the heading of 'Group Unsuitable for Injection.' 'If an internal pile is supplied by such a large terminal branch of the superior hemorrhoidal artery that, with a finger in the rectum, it can be felt pulsating, there is little likelihood of injections proving effective.'

"From what you say in your paper, I think you will probably agree with this.

"Finally, although I have no morphological

observations to make in regard to your discussion of posture in relation to hemorrhoids, my impression is that one aspect of our daily routine is of importance. I am occasionally confronted by a patient who fails to respond to injection treatment or repeatedly relapses with recurrent attacks of bleeding. In such cases I usually ask, 'For how long do you sit on the watercloset in the morning?' The patient who indicates that he occupies this department for ten or fifteen minutes, or sometimes, if it may be believed, for even longer, supplies the answer to the problem, and I immediately advise these patients to cut their time of defecation down to two minutes or less and, if necessary, to try again later in the day. I feel sure that this instruction and a change of routine has helped many a patient to adopt better habits with reduced congestion in the internal as well as the external hemorrhoidal plexuses.

"In conclusion, may I say that I admire your phrase 'winking the anal sphincter,' a very expressive and descriptive term for sphincter exercises, and one which is particularly applicable to some patients with relaxed sphincters, who at first seem unable to do a voluntary sphincter contraction without a curious contortion of the legs, body and buttocks."

# MELANOSIS COLI

## EXPERIMENTAL OBSERVATIONS ON ITS PRODUCTION AND ELIMINATION IN TWENTY-THREE CASES

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MELANOSIS coli is the pigmentation of the colonic mucosa from the ileocecal valve to the anorectal line. It is found in patients with marked intestinal stasis. The gross appearance of the mucosa varies according to the intensity of pigmentation from buff to light brown, brown and black. It has a characteristic appearance of reticulation, a brown or black background with a network of light yellow striations and spots. It is variously described as resembling an alligator skin, a toad's back or a cross section of a nutmeg. Microscopically, the pigment is found in the cytoplasm of large mononuclear cells in the submucosa of the colon. There is no pigment in the epithelial cells.

The nature and origin of the pigment in this condition have been the center of interest from its discovery, more than a century ago, to the present time. At present all investigators agree that the pigment is melanin or a melanin-like substance similar to the one found in skin, hair and melanotic diseases like Addison's disease and melanotic cancer.[1–4]

### REVIEW OF LITERATURE

The first mention of pigmentation of the colon was made by Curveillier,[5] who in 1828 at autopsy found a case in which the colonic mucosa was as black as Chinese ink. Virchow[5] in 1857 described the condition and called it melanosis coli. He thought the pigment was derived from bilirubin or hemosiderin. Pick[5] in 1911 advanced the theory that melanin was formed in the bowel wall when the decomposition products of aromatic proteins, indol and skatol were acted upon by an enzyme, an oxydase. The melanin was then picked up as a foreign body by the phagocytic cells in the submucosa. This theory was generally accepted until 1928 when Bartle[6] first mentioned cascara sagrada as the possible origin of the pigment. Bockus[7] in 1933 advanced the hypothesis that the pigment was derived from the coloring matter of the anthracene compounds used as laxatives, namely, cascara sagrada, senna, aloes, frangula and rhubarb. He was able to make pigment disappear in fifteen out of eighteen cases in four to twelve months by withdrawing the anthracene laxative which the patients had been taking for a long time. In 1935 Zobel and Susnow[8] reported seven cases of melanosis. All were taking cascara. However, on withdrawing cascara they were not able to observe a single disappearance. In 1938 Hurst[9] in Guy's Hospital suggested artificial diarrhea as the cause of melanosis and not the pigment of the laxatives taken. In 1939 Corwin[10] tried to produce melanosis in dogs by feeding them cascara for one year but was unsuccessful. In 1940 Roden[11] experimented with monkeys. He was able to produce melanosis of the cecum and rectum in five weeks by administering cascara and causing diarrhea. However, melanosis was not produced in the animals that received tincture of opium along with the cascara to control the diarrhea. He believes that cascara produces melanosis only if diarrhea is present. In 1941 Block[12] was able to eliminate melanosis in three of ten cases by withdrawing cascara for three, four and six months. Buie,[13] Bacon[14] and Hayden[15] all agree with Bockus that cascara and related compounds are the cause of melanosis.

### AUTHOR'S CASES

In the last fifteen years I have been able to observe twenty-three cases of melanosis in the Rectal Clinic of the Massachusetts General Hospital. I am presenting brief abstracts of the case histories of fourteen cases, in many of which I have been able repeatedly to produce or eliminate melanosis under clinical observation by administering or withdrawing cascara.

CASE 1. Mrs. A. B., unit No. 497599, a seventy-three year old white female, came to the Clinic in April, 1946, complaining of severe constipation for ten years. Her bowels moved only after taking vast amounts of cathartics. Proctoscopy showed no melanosis. In June,

1946, she was put on cascara and oil mixture with the intention of developing melanosis. In October, 1948, she developed a fissure with marked spasm of the sphincter. In January, 1949, a partially fibrosed posterior fissure was excised. No proctoscopy was done at the time. On March 28, 1949, proctoscopy showed marked melanosis; at this time, cascara was omitted and milk of magnesia and mineral oil substituted. On June 27, 1949, she still had melanosis and also on September 19, 1949. On October 23, 1950, melanosis had completely cleared.

CASE II. Mrs. D. S., unit No. 4440, a fifty-five year old white female came to the clinic in December, 1935, complaining of constipation and pain in anus. She had taken cascara and oil for three years. Examination showed a posterior fissure accompanied by sphincter spasm. Proctoscopy showed melanosis coli. The patient was taken off cascara at that time. On November 29, 1937, the melanosis had cleared but the fissure was still present. On this date she was again put on cascara and oil. On March 2, 1938, the fissure was excised and the pecten band was incised posteriorly. On May 5, 1938, the anus was still very tight and the scar was incised posteriorly. On August 22, 1938, melanosis coli had again developed. She was taken off cascara for the second time. On June 5, 1939, melanosis had practically cleared and on August 7, 1939, the melanosis had completely cleared for the second time. On October 23, 1939, she was put on cascara again. On February 26, 1940, she developed melanosis for the third time.

CASE III. Mrs. M. H., unit No. 26329, a fifty-eight year old white female came to the clinic October 18, 1934. In 1920 she had a hemorrhoidectomy. After that she gradually developed anal stenosis and, when seen by us, a finger could not be inserted without severe pain. She was taking cathartics and enemas until recently when she could not find an enema tube small enough to use. At that time dilatation of the stricture under anesthesia was done. Proctoscopy showed no melanosis. The nature of the cathartic she was taking before this was not stated in the records. She was put on one or two alophen pills daily and a mixture of cascara and oil. On October 14, 1935, proctoscopy showed melanosis coli. She continued to use cascara and her melanosis was still present on December 11, 1939. The anus was still tight but admitted one finger with some difficulty. She was again seen on June 24, 1943, at which time she still had melanosis, was still taking cascara and still had a tight anus.

CASE IV. Mr. B. C., unit No. 38520, a fifty-two year old white male came to the clinic in 1937 because of bleeding and pain on defecation. Examination showed a large papilla posteriorly and hemorrhoids. Proctoscopy showed no melanosis. The hemorrhoids were injected with 5 per cent quinine and urea hydrochloride. On November 1, 1941, hemorrhoidectomy was done as well as a cautery excision of a rectosigmoid polyp which proved to be adenocarcinoma *in situ*. He developed severe constipation. On September 23, 1942, proctoscopy showed no melanosis and no recurrence of his growth. At this time he was put on two 5 gr. tablets of cascara daily. On July 24, 1943, proctoscopy showed melanosis had developed. The cascara was now omitted. On September 16, 1943, melanosis was lighter and on December 16, 1943, it had disappeared. He did not take any more cascara and on May 4, 1944, proctoscopy showed no melanosis and no recurrence of his growth.

CASE V. Mrs. G. F., unit No. 10299, a forty-seven year old white female came to the clinic on May 8, 1940, with fecal impaction. She had used rectal dilators for many years to relieve constipation. Examination showed large papillae and a tight anus. Proctoscopy showed no melanosis. She had never taken cascara. She was put on magnesium oxide. The tightening of the sphincter increased and she was allowed to use digital dilatation. On January 31, 1942, a stricture was dilated. Proctoscopy showed no melanosis. On July 11, 1942, dilatation of the anus under anesthesia was done again with posterior division of the stricture. The stricture was again present and she was again using enemas and dilators. On November 7, 1943, she was put on a mixture of cascara and oil with the intention of developing melanosis. On April 3, 1944, melanosis had developed. At that time she was taken off cascara. On September 4, 1944, the melanosis was lighter and on March 29, 1945, it was completely gone. On December 2, 1946, proctoscopy showed no melanosis and she was no longer taking cascara.

CASE VI. Mrs. S. D., unit No. 285242, a fifty-two year old white female came to the clinic February 3, 1941, complaining of constipation and rectal bleeding. She had been tak-

ing some laxative for thirty years, cascara tablets for ten years and liquid cascara for one year. Proctoscopy showed marked melanosis coli. Her hemorrhoids were injected with 5 per cent quinine and urea hydrochloride. The cascara was omitted. In April and July, 1941, melanosis was still present; the anus was getting very tight. On October 27, 1941, the anus was getting tighter and melanosis had practically disappeared but was still recognizable. On January 26, 1942, the melanosis was gone. On March 16, 1942, she was put on cascara again. On June 6, 1942, there was no melanosis; on December 28, 1942, melanosis was moderate; on April 29, 1943, marked melanosis was present and the anus was still tight.

Case vii. Mr. G. C., unit No. 365011, a fifty-two year old white male came to the clinic on June 24, 1943, complaining of severe constipation. He had been using rectal dilators for fifteen years but had no stricture. Proctoscopy showed no melanosis. He was considered a suitable subject to put on cascara for the purpose of developing melanosis. He was consequently started on a mixture of cascara and oil and was advised to omit the dilators. On October 17, 1943, biopsy of the mucous membrane of the rectum showed some pigmentation in the submucosa. There was no gross melanosis. On April 10, 1944, proctoscopy showed definite melanosis; in June, 1944, the melanosis was marked. At that time he was taken off cascara and was given mineral oil and milk of magnesia. On March 8, 1945, proctoscopy showed no trace of melanosis.

Case viii. Mr. C. B., unit No. 66267, a fifty-four year old white male came to the clinic on November 8, 1943, with a stricture of the anus which had resulted from a hemorrhoidectomy performed elsewhere one year previously. He was put on cascara and petrogalar for the purpose of developing melanosis. Proctoscopy showed no pigmentation of the rectal mucosa. On April 24, 1944, there was no melanosis. He had been taking cascara and petrogalar only twice a week. On July 16, 1945, the anus was tight; there was no melanosis. He was not taking cascara regularly. On February 28, 1946, the mucous membrane looked dusky and a biopsy was taken. The pathologic examination showed definite microscopic evidence of melanosis coli. He did not continue to take cascara regularly. An operation for lipoma of the ascending colon and another for inguinal hernia were performed during the next three or four years. In February, 1950, he still had the stricture but had changed to other cathartics although he occasionally took cascara. Proctoscopy showed no gross melanosis.

Case ix. Mrs. E. C., unit No. 69740, a forty-seven year old white female came to the clinic on August 8, 1937, complaining of constipation. Her bowels moved only with cathartics. She had been taking cascara tablets daily for fourteen years. Examination revealed the presence of hemorrhoids and melanosis coli. On September 24, 1937, a hemorrhoidectomy was performed and cascara was omitted. On November 29, 1937, melanosis was intense and on February 17, 1938, it was still present. On June 14, 1943, she came to the clinic again stating that she had omitted cascara in 1937 for only six months but that she had to start taking it again because the mineral oil was leaking and was not satisfactory. She had kept on taking cascara for the past five years. Proctoscopy showed intense melanosis. At that time cascara was omitted and milk of magnesia substituted. On November 14, 1943, melanosis was lighter and on March 6, 1944, it had cleared. She had kept off cascara.

Case x. Mrs. I. B., unit No. 546172, a forty-eight year old white female came to the hospital suffering from carcinoma of the sigmoid. On March 25, 1948, she had an anterior resection with low anastomosis. There was no melanosis in the specimen. She had not been taking cascara. She became very constipated and could move her bowels only with enemas. On November 18, 1949, proctoscopy showed no melanosis. Biopsy of the rectal mucosa showed no microscopic melanosis. At that time she was put on a mixture of cascara and oil. On September 18, 1949, eleven months later, proctoscopy showed marked melanosis.

Case xi. Mrs. H. R., unit No. 97106, a sixty-eight year old white female came to the clinic on December 30, 1937, with a stricture of the anus which had been present for the previous two years. She had had two operations for hemorrhoids and fissure and one for dilatation of a stricture. For many years she had been taking "herb tablets" which contained aloes. She had continued to take "herb tablets" but did not return for proctoscopy until March 21, 1938. At that time her rectum showed marked melanosis. The "herb tablets" were now omitted. She returned to the clinic on July 8,

1943, five years later. The anus was still tight; she was taking milk of magnesia and salts for her bowels but proctoscopy showed no trace of melanosis.

Case xii. Mr. M. R., unit No. 42514, a fifty-seven year old white female came to the medical clinic on March 11, 1933, because of severe constipation of many years' duration. She moved her bowels with enemas. She was advised to take a mixture of cascara and oil. She came to the rectal clinic on May 24, 1937. She had continued with cascara and was taking large quantities. Proctoscopy showed marked melanosis. Cascara was omitted and magnesium oxide was substituted. On October 4, 1937, proctoscopy showed the melanosis had cleared.

Case xiii. Mrs. C. G., unit No. 8743, a seventy year old white female came to the clinic in September, 1940, complaining of increasing constipation with decreasing caliber of stool of several months' duration. Proctoscopy showed no melanosis. Rectal examination showed some anal stenosis. She was put on kondremul with cascara. On November 17, 1941, proctoscopy showed definite melanosis in the last 2 inches of the rectum.

Case xiv. Mrs. S. Q., unit No. 113941, a fifty-five year old white female came to the hospital in 1945 with a stricture of the anus resulting from a hemorrhoid operation which had been performed elsewhere one year previously. She could move her bowels only with ex-lax (phenolphthalein). She had had two operations for stricture in 1945. No proctoscopy was reported in her record. She continued with ex-lax. In 1947 she had vulvectomy for leucoplakia. The anus continued to be tight and she had great difficulty with her bowel movement. In 1949 she started taking petrogalar. On September 15, 1950, because of her difficulty with bowel movements, she started to take senna leaves every night. She also took an occasional alophen pill during the past one and a half years but had not taken more than twenty-five of them all together. On November 16, 1950, she came to the clinic again complaining of the same bowel difficulty. The anus was still tight. Proctoscopy with a small caliber instrument showed a slightly dusky mucosa. Because such a case might ideally have developed melanosis from senna, we took a biopsy of the mucous membrane. This showed microscopic melanosis coli.

In the remaining nine cases, only one observation was made. The patients did not return for follow-up. We failed to produce melanosis by administration of cascara in only two suitable cases. One man, age seventy, who had a stricture was followed for only six months and another patient was followed for only one month. I am sure that with sufficient follow-up both cases would have developed it. We did not fail to eliminate melanosis in any of the cases which we were able to follow.

### ANALYSIS OF EXPERIMENTAL RESULTS

In analyzing these twenty-three cases we find that there were sixteen females (70 per cent) and seven males (30 per cent). The ages varied from forty-five years to seventy-five years, with an average age of fifty-nine years. The incidence was approximately 1 per cent of the cases proctoscoped. This is probably a low figure because surgical cases and those requiring study for the presence of organic pathology in the colon are the only patients referred to our rectal clinic. Cases of plain constipation go to the medical clinic. Eight cases had actual organic strictures and six others had chronic fissures with sphincter spasm, making a total of 60 per cent of the cases with anal obstruction. Of the fourteen cases in which we were able to make repeated observations, eight had organic strictures of the anus. I think this is a significant factor. Eighteen patients had been taking cascara sagrada for periods of a few months to many years. One had been taking "herb tablets" (aloes). Three had been taking "nature's remedy" (cascara, aloes). One had taken senna. Thus twenty-one patients had taken cascara in some form, one senna and one aloes, all of which were laxatives of the anthracene group. Ninety-one per cent of the patients had taken cascara.

In the fourteen cases whose abstracts are given previously, we were able to make repeated observations after either administering or withdrawing cascara. Whenever cascara was withdrawn, mineral oil or milk of magnesia was substituted. Over a period of fifteen years we were able to produce melanosis eleven times by administering cascara and to eliminate it nine times by withdrawing cascara. The shortest time for the production of melanosis was four months, the longest was thirteen months, with an average of nine months. The shortest time for the elimination of melanosis was five

months, the longest was eleven months, with an average of nine months.

All observations were made through a proctosigmoidoscope introduced at least up to the rectosigmoid. In all but two cases the melanosis was more marked in the lower rectum and invariably became lighter toward the rectosigmoid. In a few cases only the lower half of the rectum was involved. In two cases, however, the melanosis was more pronounced at the rectosigmoid.

In the course of this investigation it became apparent that actual anal obstruction was a prominent feature in the cases of melanosis coli. With this in mind, we selected some cases (Cases I, III, IV, VII, VIII, X, XIII, XIV) who had not taken cascara and had no melanosis the first time we saw them. Six of these had anal obstruction. One (Case VII), although on examination a tight anus was not present, had been using rectal dilators for fifteen years to help move his bowels. Case X had an anterior resection of the rectum for carcinoma of the rectosigmoid with a very low anastomosis. Apparently the patient had lost the defecation reflex and could not move her bowels without enemas. We considered these cases suitable for the production of melanosis coli. We administered cascara and all of them developed melanosis under clinical observation. In Cases I, IV and VII cascara was withdrawn and melanosis was eliminated. Case III would not omit cascara and nine years later still had melanosis. Case VIII was taking cascara only occasionally and developed microscopic melanosis only, which shows that the amount and frequency of cascara administered is a factor in the production of melanosis. It is probable that the obstruction results in increased pressure in the rectum, and this forces the melanin through the epithelium to the submucosa where it is found in the phagocytic cells. This is in agreement with the experience in carcinoma of the colon in which Stewart and Hickman[16] found melanosis above the obstruction in 68 per cent of one hundred cases.

I believe that physiologically intact mucous membrane allows little if any pigment to go through and cause melanosis. The mucous membrane can be affected and become more permeable by anal obstruction, old age, constant injury from dilators or enemas and by a very marked degree of constipation of many years' duration. In these cases, administration of cascara will invariably produce melanosis if continued long enough. Cascara will not produce melanosis in a well functioning mucous membrane. That is the reason we see so little of it, especially in younger people. Younger people who take cascara do not develop melanosis. As an example, in our clinic we have seen a woman, age forty, who took daily alophen pills (aloes) for ten years; another woman, age forty, who took senna leaves daily for sixteen years and still another woman, age thirty-three, who took cascara for eighteen years. None of these women developed melanosis.

There must be many cases of microscopic melanosis which, of course, we cannot observe clinically unless we do biopsies. Such a routine procedure is not warranted. Case VIII illustrates this point. The patient was not taking enough cascara and, as a result, he developed only microscopic melanosis. Apparently the pigment is carried away by the phagocytic cells and is metabolized as fast as it penetrates the mucosa, and there is not enough of it accumulated to become grossly visible.

I have not been able to observe any symptoms due to melanosis directly. The pigmentation of the mucosa seems to be the effect of cascara in cases of intestinal stasis. We followed one of our patients (Case III) for nine years. During all that time the patient had intense melanosis. The only symptoms complained of were those associated with bowel difficulties resulting from anal stricture. The only clinical significance I can see is the value of its ready recognition and differentiation from melanotic cancer. Such mistakes have occurred[17,18] and have caused unnecessary grief to the patient's family and embarrassment to the doctor.

## CONCLUSIONS

From these observations the following conclusions seem to be justified:

1. Cascara sagrada or one of the related compounds is the source of the pigment found in melanosis coli.

2. Anal obstruction seems to play a major role in the pathogenesis of melanosis coli.

3. It is possible to eliminate melanosis by withdrawing cascara in every case, provided the drug is withheld for a year or more.

4. It is possible to produce melanosis by administering cascara in a large percentage of suitable cases, provided the drug is given for a year or more.

5. Suitable cases for the development of melanosis are those with anal obstruction and those in which no bowel movement is possible without the use of vast amounts of cathartics, rectal dilators or enemas.

6. The frequency and the length of time of the administration of cascara or related compounds is important in the production of melanosis. If the laxative is not taken frequently, gross melanosis may never be produced because the elimination of the pigment may be equal to the amount penetrating the mucosa. The reverse is also true. If the patient does not cooperate when cascara is withdrawn and occasionally cheats, the melanosis may never be eliminated.

7. Plain ordinary constipation, necessitating cascara or related laxatives over a period of years, especially in younger people, will not result in gross melanosis. Many cases, however, will show histologic evidence of the presence of pigment penetration of the mucosa.

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DISCUSSION

Ernest N. C. McAmmond (Vancouver, B. C.): Most investigators agree that melanosis coli cannot be held responsible for any known complaint or symptom-complex. With this Dr. Speare concurs. Proctologists have the reputation of being very practical people, and it is good to learn of careful, painstaking, scientific research being undertaken and having for its only purpose the extension of the field of human knowledge.

In his opening paragraph Dr. Speare states, "In carcinoma, melanosis coli is always found above the lesion, except in carcinoma of the cecum." Perhaps it might be well to clarify that point a little. Steward and Hickman report that in a hundred clinical cases of carcinoma of the colon incidence of macroscopic melanosis was only 55 per cent. They also state that while the pigmentation is most striking above the growth, it is frequently to be found *below* the neoplasm as well, and in a fair percentage of instances is as marked below as it is above.

I have been unable to find a report on any extensive investigations as to what part is played by the anthracene purgatives in those cases of melanosis associated with carcinoma. It will be instructive to learn as to whether the anthracene drugs are necessary to the production of the pigment in the bowel wall in cases of malignancy as they apparently are in its production in the lower portion of the large intestine. Our speaker today has told of one case of carcinoma of the sigmoid colon resected in March, 1948. The specimen showed no melanosis and the history specifically indicated that the patient had *not* taken cascara. It may be that even in the pigmentation found in cases of carcinoma there is a relationship to the ingestion of anthracene compounds. (On the other hand, it is possible that the pigmentation we find in the upper portion of the colon is a different *process* from that which we are discussing today.)

Virchow coined the term "melanosis coli."

However, the pigmentation is seldom seen to be uniformly distributed throughout the colon, as the name implies, and for reference to the process under consideration here, it might be well to use the terminology of Bacon and Scheffler, namely, "melanosis proctocoli."

It is a startling and dramatic experience to look into the sigmoidoscope expecting to find the usual pink, smooth, shiny mucous membrane and to visualize one that may be almost jet black. Many of us will remember with clarity the visualization of our first case of melanosis. It is well that we should be reminded that even in the extreme, jet black picture the epithelial cells of the mucous membrane show no abnormality under the microscope, but that the pigment is located in large phagocytic mononuclear cells in the tunica propria and is not present in the epithelium. We have yet to learn exactly how this pigment passes through the epithelial cells and reaches the submucosa.

Dr. Speare has been very careful and critical in the conclusions he has permitted himself to draw from his experiments. I think he has shown us that in most cases three factors are necessary in the production of melanosis coli: (1) An unhealthy or at least an aging bowel. (He has not observed melanosis in younger individuals, even though some of them have consumed cascara for many years and in large and consistent daily doses.) (2) Anal obstruction. (This results in rectal stasis and permits prolonged contact of fecal material with the rectal mucosa, and thus the easier absorption of the melanotic material.) (3) The ingestion of anthracene drugs has been clearly shown to be the *sine qua non* in producing the pigmentation. Dr. Speare's work refutes the opinion generally held on the other side of the Atlantic, and which follows the excellent work of Sir Arthur Hurst who believed that the chief causative factor was not an anthracene drug, but the artificial diarrhea produced by aperients of *any* kind (taken on account of constipation or the fear of constipation). The work just presented to us shows that when a diarrhea is produced and maintained with purgatives *other* than the anthracenes that no melanosis results, and further, that melanosis already present can be made to disappear even when the diarrhea is maintained but with non-anthracene drugs.

Dr. Speare has referred to the work of Roden, who was unable to produce melanosis coli in monkeys when the diarrhea produced by the cascara was controlled by the administration of tincture of opium, but when no tincture of opium was given, the melanosis quickly developed. Our speaker has also remarked that he has not observed the production of melanosis in young adults even though the individuals have consumed large doses of anthracene purgatives for ten or more years.

There appears to be a balance between the amount of melanin complex absorbed and the ability of the phagocytes to remove that amount. When the amount removed equals the amount absorbed, no visible pigmentation results; and when the amount absorbed is greater than the amount removed, melanosis does develop. In the case of monkeys the amount absorbed was reduced by changing the rectal content from liquid to semi-solid, and it is probable that the administration of cascara could have been continued for years without the production of melanosis, and that the failure of its production was not due to too short a period of administration, as Dr. Speare indicated, but rather to the decreased absorption, the rate of removal remaining the same. In reference to the non-production of pigment in young adults, again the amount of melanin complex removed is equal to the amount absorbed, due to the probability that their physiologically intact mucous membrane allows less pigment to pass through, and also due to a more active cellular metabolism existing in the bowel of the younger person, permitting a faster removal. However, perhaps our discussion is becoming somewhat hypothetical. From the practical viewpoint we may remind ourselves that to the inexperienced practitioner the unexpected visualization through the sigmoidoscope of a deep melanotic pigmentation is a most alarming experience. Some of us here can recall having brought mental relief to terrified patients who have been advised mistakenly by their physicians that they were suffering from a hopelessly incurable condition, when melanosis proctocoli was the benign and correct diagnosis, the doctor's judgment having been overwhelmed by the dramatic picture observed through the sigmoidoscope.

# A CONSIDERATION OF THE NEWER ANTIBIOTICS*

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FIRST I should like to say a word or two about what might now be considered the older antibiotics. Today penicillin and even streptomycin probably would be considered old. Penicillin, however, is still a highly satisfactory, safe and relatively inexpensive antibiotic agent and I should like to emphasize this fact as effectively as possible. Any of the infections which previously responded to penicillin will still respond to it, with perhaps the single exception of the staphylococcal infections. For these, some of the newer antibiotics are to be preferred. There is no doubt that staphylococci possess the ability to develop resistance to penicillin although certainly this is not true of other microbes.

Streptomycin, also, is still an effective antibiotic agent against infections of the blood stream as well as the urinary tract when the causative organisms are susceptible to it. Streptomycin is exceedingly effective in the treatment of tularemia and certain forms of tuberculosis, including anorectal and other intestinal forms of the disease. There seems to be unjustified apprehension on the part of many clinicians and investigators concerning the toxicity of present day forms of streptomycin. The preparation of choice for streptomycin therapy at present is dihydrostreptomycin sulfate which is dispensed in solutions ready for administration. Neurotoxic effects are unlikely to occur if no more than 2 gm. of dihydrostreptomycin sulfate are given intramuscularly per day for no longer than twelve to fourteen days, provided, of course, the patient has normal renal function. In the absence of any renal damage 1 gm. of dihydrostreptomycin sulfate may be administered daily by the intramuscular route for as long as four weeks without fear of a toxic reaction in the eighth nerve. Recent trends, which I shall mention later, amply justify emphasizing the importance of streptomycin in the field of therapy. Among the newer antibiotics are chloramphenicol, aureomycin, terramycin, neomycin, the polymyxins, bacitracin and viomycin. This list by no means includes all the antibiotics known to the scientific investigator, but certainly it includes most of those which should concern us at present. I believe most investigators will agree that the most important antibiotics are chloramphenicol, aureomycin and terramycin.

## CHLORAMPHENICOL

The introduction of chloramphenicol was an exceedingly important contribution to antibiotic therapy. In addition to its wide range of activity against certain gram-positive and gram-negative organisms, chloramphenicol possesses activity against the Rickettsial microorganisms and has proved exceedingly effective in the treatment of murine as well as scrub typhus, Rocky Mountain spotted fever and other important rickettsial diseases. Furthermore, from the beginning it has been and still is the drug of choice in the treatment of typhoid fever. In treatment of the latter infection chloramphenicol is superior to the other two closely related antibiotics, namely, aureomycin and terramycin. Aside from the fact that chloramphenicol is more effective in typhoid fever, however, my opinion is that it has no advantage whatsoever over aureomycin or terramycin. I shall briefly give my reasons for this statement.

First, chloramphenicol is not as effective, weight for weight, against certain important microbes as are the other two antibiotics. Secondly, chloramphenicol does not appear to be excreted in a biologically active form in the bile. In other words, in the treatment of an infection such as cholangitis the substance is not present in an active form in the biliary tract. Thirdly, large amounts of chloramphenicol are excreted in a biologically inactive form in the urinary tract. Therefore, in the treatment of biliary infection, as well as in the treatment of infection of the urinary tract, it obviously is not as good an antibiotic as the other two. Finally, chloramphenicol is a nitrophenol com-

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pound and has been shown to have a suppressive effect on the bone marrow, fatal aplastic anemia being reported[17] to develop in the patient receiving this antibiotic. I realize that the incidence of suppression of the functional activity of bone marrow is not high and the development of aplastic anemia is not common. However, I can see no defense for the use of chloramphenicol when aureomycin and terramycin are equally if not more effective and to date disturbance of the hemopoietic system has not been reported following their use. I repeat, therefore, that these reasons justify the preference of aureomycin or terramycin with only one exception, and that is in the treatment of typhoid fever.

### AUREOMYCIN

Evidence indicates that aureomycin is one of the most important contributions to antibiotic therapy developed to date. It has a wide range of antibacterial activity, inhibits the rickettsial microorganisms and has some antiviral activity. The intelligent use of this or any other antibiotic depends not only on knowing something about its antibacterial activity but also knowing something about how the antibiotic behaves once it has been introduced into the body. Following the oral administration of 750 mg. of aureomycin, activity of the drug can be demonstrated in the serum of patients for a number of hours. On the other hand, there is a tendency for the blood levels to begin to decrease six hours after the last dose and for this reason my colleagues and I[8] advocate administration of aureomycin every six hours. Some investigators administer it every eight hours. Many clinicians, however, have been giving it every three or four hours. Because of the serum levels which I have just mentioned, I am convinced that it is not at all necessary to give aureomycin at such short intervals, in other words, no oftener than every six hours.

Antibacterial amounts of aureomycin can be demonstrated in the serum, spinal fluid, liver, kidney, spleen and lung. Furthermore aureomycin traverses the blood-brain barrier; and when therapeutically effective amounts are present in the blood serum, adequate amounts usually will be found in the spinal fluid. This is of considerable importance in the treatment of infections of the central nervous system including meningitis and syphilis. Aureomycin readily traverses the placenta; and when therapeutically effective amounts are present in the serum of the mother's blood, the blood serum of the cord also will contain adequate amounts of the antibiotic. This is of considerable importance in the treatment of infections, including syphilis, in pregnant women. When therapeutically effective amounts of aureomycin have been administered, it diffuses into the pleural space and antibacterial activity can be demonstrated in the pleural fluid. This is of importance in the use of the agent in the treatment of infections of the pulmonary tree and pleural cavity. Aureomycin is concentrated in the liver and excreted in rather large amounts in the bile. It was evident from some of our studies that the quantity of aureomycin in the bile often would be as much as eight to sixteen times the amount present in the blood serum. This immediately suggests that aureomycin should be useful in the treatment of infections of the biliary tract. Large amounts of aureomycin are excreted in the urine. This observation, however, does not always indicate the therapeutic effectiveness of the antibiotic in the treatment of infections of the urinary tract because the antibiotic content of the urine does not actually represent the antibiotic content of the tissue, which is, after all, probably more important.

At this point I should like again to mention what we consider to be the optimal dose of aureomycin. For oral administration to adults the recommended daily dose is 750 mg. every six hours, for older children 500 mg. every six hours and for young children and infants 250 mg. every six hours. A convenient method of administering aureomycin to children is to remove the contents of the capsules and place them in the center of a large spoonful of ice cream or jam. For patients who are critically ill it is recommended that 0.5 gm. of aureomycin be administered every twelve hours by the intravenous route. The material is dissolved in approximately 100 to 200 cc. of saline solution and administered rapidly. Aureomycin should be given into the veins of the arm and not into the veins of the lower extremity. The continued use of aureomycin is irritating and venous thrombosis may occur, but this complication is of no great significance in the upper extremities.

Space does not permit a detailed discussion of all the clinical applications which aureomycin has enjoyed. It is effective against most gram-positive pyogenic organisms and many gram-

negative microbes. Therefore, it has been of clinical importance in the treatment of suppurative lesions, bacteremia, infections of the urinary tract and others. It was evident from some studies reported by my colleagues and me[14–16] that aureomycin was highly effective when given by the oral route in the treatment of syphilis. This includes not only early, darkfield positive syphilis but also late syphilis and syphilis of the central nervous system. The syphilologists have noted striking change in the spinal fluid of patients who have been taking aureomycin for syphilis of the central nervous system. Aureomycin, when combined with dihydrostreptomycin, has been found by Barber and me[6,7] to be exceedingly effective and, in fact, the method of choice in the treatment of brucellosis. In addition to all of this, aureomycin is highly effective in the treatment of the rickettsial diseases including typhus, Rocky Mountain spotted fever and Q fever. The evidence seems to indicate clearly that aureomycin is of value in the treatment of so-called virus or primary atypical pneumonia. In spite of some earlier reports, however, aureomycin is not effective against most of the true viruses, such as the virus of herpes, poliomyelitis or influenza.

I should like to mention in more detail a few situations in which it appears to me that aureomycin is of particular interest to the proctologist or individual dealing with diseases of the gastrointestinal tract, particularly the large bowel. It is my conviction that no patient with an organic heart murmur should undergo rectal operation without the benefit of preoperative preparation with either aureomycin or terramycin. This should be given for at least one or two days before the operation and continued during the postoperative period. I am sure that bacterial endocarditis can be prevented by the routine use of one of these antibiotics in these cases.

It now seems well established that aureomycin is of value in the prevention as well as the treatment of peritonitis. Practically all of the organisms which inhabit the intestinal tract are susceptible to the antibiotic activity of aureomycin. It is not surprising, therefore, that most investigators have found aureomycin to be an effective agent in the preoperative preparation of patients who are to undergo operations on the bowel. The recommended dose of aureomycin for this preparation is 750 mg. given orally four times a day for three days. Dearing and Heilman[3] recommended that it be given at the same time or close to the time when the patient is fed. Also, best results will be obtained when the patients are given aureomycin in conjunction with a low residue diet. However, intestinal obstruction, fistulas and perforated lesions in the bowel all interfere with the ability of aureomycin to remove all susceptible bacteria when this method of preparation is used. It seems to me that this is a real advance in preoperative management as well as in the control of infection in the postoperative period.

In the treatment of peritonitis, aureomycin has proved of considerable value. Even in the presence of continuous nasal suction we have used aureomycin successfully in the treatment of peritonitis. The practice is to administer 750 mg. through the intranasal tube and to clamp the tube for approximately two hours during which time absorption will occur. This is repeated four times a day. Likewise, the patient may receive 0.5 gm. of aureomycin by the intravenous route every twelve hours, as indicated previously. Septicemia owing to most of the organisms present in the intestinal tract has been successfully treated by this method.

The general subject of aureomycin in the treatment of amebiasis is, I am sure, of considerable interest to the proctologist and gastroenterologist. Enough evidence seems to have accumulated to lead one to the conclusion that aureomycin, as well as terramycin, is rather active in the treatment of amebiasis. There are those who are of the opinion that the action is indirect, namely, that the marked suppression of the intestinal flora causes the amebas to have nutritional deficiency and therefore aureomycin acts in a secondary way. Recent reports, however, indicate that there is a direct amebacidal action. Regardless of this controversy the use of aureomycin in large doses seems indicated in the treatment of amebic dysentery.

Of further interest to the proctologist, it seems to me, is the fact that many investigators report encouraging results following the use of aureomycin in the treatment of granuloma inguinale and lymphogranuloma venereum. Certainly the results to date justify continued investigations along these lines. Obviously, far advanced conditions with marked anatomic deformity cannot be expected to respond to an

antibiotic agent, but in those situations it would be well to combine antibiotic therapy with surgical treatment. In many other situations aureomycin will be found of value in conjunction with surgical treatment. Any infected lesion around the rectum and anus should do better when aureomycin is combined with surgical treatment. Although a few reports have suggested that symptomatic improvement in non-specific ulcerative colitis may follow treatment with aureomycin, in my opinion no conclusive evidence is at hand as yet which would lead to the conclusion that aureomycin is of great value in the treatment of this rather perplexing disease.

The matter of toxicity or untoward reactions, as well as side effects, of aureomycin will be discussed in connection with the same subject with regard to terramycin.

### TERRAMYCIN

My colleagues and I[10] have been considerably interested in studies of terramycin. Terramycin like aureomycin is one of the most important recent developments in antibiotic therapy. It behaves like aureomycin, it has a wide range of bacterial activity, its use is associated with little or no toxic reaction and its cost is approximately the same as that of aureomycin. Solutions of terramycin are far more stable than those of aureomycin and therefore it has advantages from the laboratory standpoint.

Although it behaves in the body much like aureomycin, there are some striking differences. Following the oral administration of 750 mg. of terramycin, effective blood levels persist for many hours. As with aureomycin the serum content begins to fall six or eight hours after administration. For that reason terramycin should be administered every six to eight hours. There is no need for giving it any oftener. Certain studies which we carried out on the diffusion of terramycin into the spinal fluid indicated that even when therapeutically effective amounts were present in the blood serum, little or no activity could be found in the cerebrospinal fluid. This is in contrast to the ease with which aureomycin appears to traverse the blood-brain barrier. Terramycin, on the other hand, freely traverses the placental barrier, and when therapeutically effective amounts are present in the blood serum of the mother, the cord blood will be found to contain adequate amounts of terramycin. Likewise, terramycin diffuses readily into the pleural fluid and should prove effective in the treatment of infections of the pulmonary apparatus. As is true of aureomycin, terramycin is concentrated in the liver and excreted in goodly amounts in the bile. We have already demonstrated the fact that terramycin is of value in the treatment of infections of the biliary tract. Enormous amounts of terramycin are excreted in the urine. Clinical studies to date indicate that terramycin is an effective agent in the treatment of certain infections of the urinary tract. Also, large amounts of terramycin are excreted in the feces. It has a profound effect on the bacterial flora of the intestinal tract. Practically all bacteria as well as bacteroides are completely eliminated from the stool following the oral administration of 750 mg. (three capsules) of terramycin every six hours. It is evident from these facts that terramycin is equally as effective as aureomycin in the treatment of infections of the intestinal tract and in the preparation of patients for operations on the bowel.

Some reports[11] have suggested that aureomycin and terramycin might be given per rectum, but studies carried out on our services at the clinic revealed that no absorption of either of these antibiotics followed this method of administration.

The recommended daily dose of terramycin is exactly the same as that recommended for aureomycin. It is administered every six hours by the oral route and every twelve hours by the intravenous route.

Like aureomycin, terramycin has proved of exceeding value in the treatment of a wide variety of infections including bacteremia and peritonitis which have followed or complicated operative procedures or perforations of the intestinal tract. We have successfully treated bacteremia owing to gram-negative and gram-positive microbes with this antibiotic. All of you are aware of the high mortality that occurred in bacteroides bacteremia before the introduction of these newer antibiotics. Penicillin was of little or no value in treatment of bacteroides infections. We have successfully treated two critically ill patients suffering from bacteroides bacteremia with terramycin; one had a perforating diverticulitis and the other had an infection of the colon. Both patients recovered from what appeared at the beginning to be fatal infections. Terramycin, like aureomycin, is highly effective against the rickettsial infections. Some reports

have indicated that terramycin, weight for weight, is more effective against certain rickettsial microorganisms. Terramycin, when combined with dihydrostreptomycin, is equally as effective as aureomycin and dihydrostreptomycin in the treatment of brucellosis.

Terramycin should be of interest to the proctologist and gastroenterologist for exactly the same reasons that aureomycin is. If a patient is sensitive to aureomycin or cannot tolerate it, he may well be able to tolerate terramycin. Terramycin has a profound effect on the intestinal flora in man and has already been shown to be highly effective in the preoperative preparation of patients who are to undergo operations on the bowel or transplantation of the ureters. In fact, according to Di Caprio and Rantz[4] the effectiveness of terramycin for the preparation of patients for surgical measures on the bowel appears to be unexcelled. Likewise, terramycin is equally as effective as aureomycin for prophylactic purposes, namely, its use in patients who have organic heart murmurs and who are to have rectal operations. Terramycin has been found to be highly inhibitory for the growth of Endamoeba histolytica, and clinical reports are now appearing which would indicate that this antibiotic also should prove effective in the treatment of amebiasis. Caldwell[2] reported that terramycin was effective in the treatment of Shigella dysentery. I am not familiar with any clinical reports on the use of terramycin in the treatment of lymphogranuloma venereum and granuloma inguinale. However, I suspect that terramycin would be as effective as aureomycin.

### SIDE EFFECTS OF AUREOMYCIN AND TERRAMYCIN

No serious toxic or side effects have been reported to date after the administration of either aureomycin or terramycin. Probably the commonest and most troublesome problem encountered in the past has had to do with gastrointestinal irritation, predominantly associated with nausea or vomiting. The use of aluminum hydroxide gel is helpful in controlling the nausea and vomiting which may occur in patients receiving aureomycin and terramycin. However, the gels interfere somewhat with the absorption of these antibiotics and in general should not be used. The incidence of nausea and vomiting, however, has been markedly reduced in cases at the Mayo Clinic since it has been our policy to administer aureomycin and terramycin with cold, pasteurized milk, as suggested by Bartholomew and Nichols.[1] The use of milk, however, may be undesirable in the preoperative preparation of patients who are being maintained on a low residue or non-residue diet. Furthermore, some individuals cannot tolerate milk. Wellman and Parsons[18] have found that sodium bicarbonate can be substituted for milk and this will control the nausea and at the same time does not in any way interfere with the absorption of these antibiotics. They administer 5 gr. of sodium bicarbonate with each 250 mg. capsule of the antibiotic.

It is not surprising that after prolonged use the marked suppressive effect of both of these antibiotics on the bacterial flora has been associated with some evidence of vitamin deficiency. This is not a serious problem and can be combated simply by the daily administration of a multiple vitamin preparation. A rather marked change has been shown to occur in the bacterial flora of the mouth of patients receiving aureomycin or terramycin. The normal bacterial flora disappears and a fungous flora is established which usually contains Monilia albicans. This may result in the development of glossitis. The development of black tongue is an interesting side effect which on occasion may follow the use of either aureomycin or terramycin. Downing[5] is of the opinion that this also represents a deficiency of the components of the vitamin B complex.

Perirectal irritation and also vaginal irritation with pruritus is well recognized by those who have used either aureomycin or terramycin to any extent. It seems likely that here again the matter is one of suppression of the normal bacterial flora which in turn allows an overgrowth of monilia. I know of no highly effective method of dealing with the rectal irritation other than to discontinue the medication. Witch hazel packs are at times helpful. Likewise, the local application of gentian violet around the rectum and vagina may control the monilia.

The incidence of skin reactions following the administration of aureomycin and terramycin seems unusually low. Literally thousands of patients have been treated with both these antibiotics and yet the literature contains only a few reports of cutaneous toxic reactions. They can occur, however, and may take the form of an urticarial reaction or the rash may be in the

nature of a maculopapular one. Elimination of the drug usually will be followed with cessation of the toxic effects within a few days.

I am sure you are familiar with some reports to the effect that the use of these antibiotics may interfere with the coagulability of the blood. It is my conviction that although minor changes may follow the use of these antibiotics, this phenomenon is of no practical significance whatsoever.

### MISCELLANEOUS ANTIBIOTICS

When the newer antibiotics are being considered, it is essential to mention several other antibiotics which have been studied recently. Neomycin is relatively new. It has considerable antibacterial activity, including activity against Mycobacterium tuberculosis. On the other hand toxic reactions involving the eighth nerve, as well as renal damage following the use of neomycin, clearly indicate that this antibiotic should not be used in the treatment of human beings. Too many other effective antibiotic agents are available to justify the use of neomycin unless its toxic properties can be abolished. The same can be said for both polymyxin A and polymyxin B. Bacitracin, likewise, is too toxic for general systemic use, although it is an effective antibiotic agent for local treatment of wounds or superficial infections due to organisms susceptible to its action. Viomycin possesses the ability to inhibit Myco. tuberculosis. However, its possible value in the treatment of clinical tuberculosis has not been established.

### COMBINED ANTIBIOTIC THERAPY

With the advent of many useful antibiotics, it is not at all surprising that the use of combinations of these antibiotics has come into vogue. This is one of the most interesting and important problems which confronts us at present. Although the intelligent combination of antibiotic agents is highly useful and desirable, there are certain pitfalls if it is done without regard for the phenomenon of interference. The studies of Jawetz and Speck,[13] Hunter[12] and others clearly indicate that certain combinations of antibiotics may be undesirable rather than helpful in the management of infections. For example, penicillin is known to inhibit bacteremia best during the period of rapid multiplication of the bacteria. Aureomycin, when placed in contact with bacteria, slows down the growth of these organisms. Therefore, it has been suggested that it is unwise to combine penicillin with aureomycin, whereas either penicillin or aureomycin may be combined with streptomycin to a considerable advantage. In other words dihydrostreptomycin, as I said in the beginning, is still an exceedingly important antibiotic and its importance is enhanced by these recent studies on combined therapy. Heilman, Wellman and I[9] made some studies which had to do with induced resistance to terramycin. The strains of certain organisms which are made resistant to terramycin regularly develop increased resistance to aureomycin and chloramphenicol. On the other hand, these strains are not made resistant to streptomycin and at times may develop increased sensitivity to streptomycin. These findings are consistent with the favorable results I have already mentioned concerning the simultaneous use of aureomycin and streptomycin, or terramycin and streptomycin, in the treatment of brucellosis as well as other infections. Furthermore, the studies mentioned previously clearly indicate that there is nothing to be gained by switching from aureomycin to terramycin or to chloramphenicol in the face of developing resistance.

Certainly the haphazard use of combinations of antibiotics or shifting rapidly from one to another is to be thoroughly condemned. It is only by careful bacteriologic studies, including sensitivity tests, that we can treat bacterial infections intelligently.

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# RECTAL COMPLICATIONS FOLLOWING TREATMENT OF GENITOURINARY CANCER

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IT appears that symptoms of rectal bleeding, diarrhea, pain and tenesmus have been generally accepted as an expected sequel to the application of radium to cure cancer of the cervix. It is the purpose of this article to emphasize the importance of these symptoms as they often constitute a prominent part of the illness. I shall review briefly the whole problem of inflammatory reactions in the rectum secondary to radiation and discuss some of the fifty odd cases examined and treated during the past four years.

The inflammatory reaction of the rectal mucous membrane which follows irradiation of any extrarectal pelvic lesion is characterized by certain signs. Futh and Ebler[1] generally have been given credit for the original description of this condition in the rectum. In 1915 they reported five cases. Now, some thirty-five years later, if cancer has been found and treated, the postoperative observations are usually limited to the primary disease. A visual rectal examination is not usually done unless the patient is actually incapacitated by rectal symptoms.

In 1930 Buie and Malmgren[2] reported that 3 per cent of a group of 2,075 patients who had received radiation therapy for pelvic lesions had an inflammatory reaction in the rectum which they termed factitial proctitis. In this group symptoms began an average of five months following treatment. These reactions fall into two groups, transient and permanent. The transient reaction follows immediately and is characterized by the usual symptoms of bleeding, pain, tenesmus and cramps. At this stage the anterior wall of the rectum shows the usual signs of inflammation with mild ulceration and no necrosis, a condition which usually heals spontaneously within a few weeks. There are a few cases which do not heal at all and others in which the mucous membrane breaks down several months after the initial symptoms have subsided. This creates a situation favorable to the permanent rectal change secondary to radiation. These permanent reactions are manifested by different types of lesions ranging from atrophy and bleaching of the mucous membrane to necrotic, bleeding, sloughing ulcers, with stricture and fistula formation.

Todd[3] divides the permanent reactions into two groups, namely those in which the reaction is limited to the rectum and those in which the rectum is involved in massive perirectal inflammation. He refers to these as pseudocarcinoma because both types resemble rectal carcinoma in symptoms and physical signs. When the disease is limited to the wall of the rectum and the bowel is mobile, early malignancy, either primary or secondary by extension, must be considered and ruled out. Likewise, when there is an ulcerating and stenosing lesion in the rectum with massive perirectal inflammation, that is, a frozen pelvis, one is confronted with a situation resembling advanced carcinoma with extrarectal spread. The reaction is not reversible even though the patients survive the condition for which radiation was administered.[4]

Telangiectasis is a distinctive feature of the disease and bleeding in some amount is always present, even at the onset. The inflammation begins on the anterior wall of the rectum usually opposite the cervix. (In one of this group the process began just proximal to the anorectal juncture due, no doubt, to an accident or bad technic in placing the radium.) An ulcer soon forms and becomes chronic with a dirty gray slough resembling a diptheritic membrane and with its greatest diameter in the longitudinal axis of the bowel. When the process extends into and above the rectosigmoid juncture, the ulcer cannot always be visualized in its entirety as fixation of the bowel makes the passing of the proctoscope difficult and often hazardous.

The typical ulcer heals by fibrosis and the scar resembles an area of white fibrous tissue at the bottom of a saucer-shaped defect in the mucous membrane. It stands out in marked contrast to the bleeding telangiectatic area around it. Secondary involvement of the rectum by epidermoid carcinoma of the cervix is

not uncommon. In 600 cases reviewed by Mass[5] it occurred ten times.

A severe contracture of the upper rectum from a reported sterilizing dose of radium developed in one patient in the group now under study. The symptoms began a week after treatment and two years later the patient was admitted to the hospital with symptoms suggestive of bowel obstruction. Age may be an important factor as most of the patients treated fall in the age group of those with early vascular changes. Location on the anterior wall where the blood supply is poorest is another factor. It is estimated by some that the mucous membrane of the rectum will tolerate only two-thirds the amount of radiation tolerated by the normal uterus.[6] It appears that great variation in individual sensitivity exists and it is common knowledge that lymphoid tissue is the most sensitive of all structures to radiation.[7] Destruction of the perirectal lymphatics may be an etiologic factor in this condition. In patients with pelvic inflammatory disease the reaction to irradiation is more severe. Mass[5] found that in 600 cases of radiation proctitis there were 523 cases of radiation sickness. Permanent rectal changes developed in seventy patients in this group. From this it appears that there may be a correlation between radiation sickness and the more protean reactions.

In 1929 the incidence of radiation proctitis was studied at the Marie Curie Hospital[8] and was found to be 12 per cent following radium therapy to the cervix. By 1932 the incidence was reduced to 3 per cent showing that the technic or plan of treatment was an etiologic factor in the condition. Todd[3] in 1938 found the average incidence of ulceration of the rectum following radiation treatment for pelvic malignancies to be about 5 per cent and the duration of time of onset to be six months.

Randal and Buie[9] analyzed eighty-eight cases in 1943 in which the characteristic symptoms led to proctoscopic examination. They found the onset of severe symptoms occurred five to six months following treatment.

Furguson[10] in 1938 reported a case of rectal ulceration following treatment of cancer of the bladder with radium in a sixty-four year old man, another case following treatment of cancer of the prostate with high voltage roentgen therapy in a sixty-nine year old man, and six cases following treatment with radium and high voltage roentgen therapy for cancer of the cervix and uterus. In 1944 Jones[11] reported six cases of stricture of the rectosigmoid after radiation therapy of the uterus.

Baud[12] of the Curie Foundation in Paris treated 105 cases of cancer of the cervix with radium alone from 1929 to 1949. Fifteen patients had minor rectal and intestinal complaints manifested by diarrhea and blood-streaked mucus for short periods.

Craig[13] made a clinical study of 200 cases in which 186 (93 per cent) patients had received irradiation for an extrarectal pelvic malignant lesion. In some, symptoms occurred as early as one week. In one, symptoms were postponed for nearly seven years. In some there was a complicating factitial cystitis. Symptoms such as rectal bleeding, diarrhea, rectal pain, tenesmus, constipation and abdominal cramping were common. In more than half of the cases the lesion consisted of a simple proctitis without ulceration, stricture or fistula formation.

In most cases with an ulcer there is contracture of the bowel and especially is this true if the ulcer is in or near the rectosigmoid juncture where it takes little inflammation in the bowel wall to immobilize the intestine and cause a certain amount of obstruction.

Craig[13] found the lowest third of the rectum to be the only part not involved. This is not so with many cases studied by me because in many instances the complication appeared to have been caused by the accidental slipping of the radium usually from faulty technic whereas Craig's cases were treated in the same institution by specialists who have a much lower morbidity rate from the use of radium than do individual surgeons.

During the past four years fifty-one patients with this complication have been examined and in most cases a regimen of planned treatment prescribed. Of this group five are known to be dead, four from distant metastases and the other because of massive extension of the primary epidermoid carcinoma of the cervix to the rectum and entire pelvic area. Two are incapacitated with debility resulting, in one instance, from invasion of the rectum and bladder by adenocarcinoma which was primary in the fundus. This patient has a colostomy for palliation. The other has a rectovaginal fistula. In two adenocarcinoma of the rectum has developed after radiation therapy for epidermoid carcinoma of the cervix. One of these patients, a thirty-nine year old woman, has had 9,000

mg. hours of radium and considerable high voltage roentgen ray therapy over a period of four years, during which time an adenocarcinoma of the rectum developed. This patient has massive extension of the original carcinoma into the pelvis and it appears that a colostomy will soon be necessary for relief of obstruction. The other patient, a sixty-eight year old woman, has a permanent colostomy, the carcinoma of the upper rectum was removed by the Hartman method rather than by a more radical procedure as the blood supply in this area was already compromised.[14] Both of these cases showed marked mucosal atrophy, telangiectasis and fibrosis of the anterior rectal wall and had experienced symptoms of radiation proctitis since early in the period of treatment. One patient was treated with radium for a proven carcinoma of the cervix in 1925 and has had mild symptoms with a little bleeding on occasions since the treatment. Examination with the proctoscope disclosed the typical atrophic mucous membrane with telangiectatic bleeding areas on the anterior wall of the rectum.

Profuse hemorrhage is rare; however, one of these patients was admitted to the hospital in shock from hemorrhage. Fortunately she was under treatment for radiation proctitis and was known to have a sloughing ulcer in the upper rectum. After supportive treatment including transfusion the blood was aspirated from the bowel and the ulcer was packed with oxycel. The ulcer healed without further troublesome bleeding.

A sixty-two year old woman with radiation proctitis of five years' duration, after radium and high voltage roentgen therapy for carcinoma of the cervix, required an operation for obstruction in the lower sigmoid. The obstruction was due to a stricture 10 cm. in length and a double barrelled colostomy (with subsequent closure) was done instead of a primary anastomosis[14] because of unreliable circulation in tissue treated by radiation. This patient also has a radiation cystitis and the proctitis is unchanged; however, she has no ulcer. Another patient on whom a colostomy was done many years ago for a radiation stricture has complete obliteration of the upper rectum and a troublesome distal loop of bowel which is also becoming obliterated. It appears now that she has been cured of cancer but the secondary effect on the bowel has created a new problem.

Of the forty-two patients in this group who are not invalids twenty-two have ulcer, stricture or contracture of the upper rectum in some degree. There is no rectovaginal fistula in the group. The other twenty are experiencing a little bleeding and complain of some discomfort such as burning and aching on occasion. The mucous membrane shows only moderate telangiectasis and atrophy.

### TREATMENT

It must be emphasized that radiation is a radical treatment and because of its secondary effects structures adjacent to the organ treated should receive due consideration. It is my belief that less radical surgical procedures should be used instead of radium for sterilization. Some believe that irradiation treatment should be stopped once proctitis has set in but it appears to me that the minimal accepted treatment for a particular lesion should be given and the proctitis treated in whatever way the situation requires. It is obvious that the prognosis of radiation proctitis depends on the response of the primary lesion to treatment. Patients usually continue to pass a small amount of blood for years although the process is otherwise inactive. When stenosis or obliteration of the rectum has occurred or is imminent, the process is irreversible and obstruction has to be treated with a permanent colostomy. These lesions are not amenable to local reconstructive surgery because of poor blood supply.[14] Dilatation can best be accomplished by the passage of a normal stool. If stools can be kept normal, there will be some contracture but obstruction is unlikely.

Treatment of the infection in the injured bowel is important. We have found these patients do much better if treated with sulfathalidine, even in small quantities, usually 3 gm. in twenty-four hours for an indefinite period. In a few cases chloromycetin or aureomycin have been used for short periods with satisfactory results. These patients should be given vitamin K also when they are taking a drug to sterilize the bowel. A smooth diet with a muciloid laxative and adequate fluid intake will usually give a formed stool which is not traumatising. It is obvious that hard feces pressing on an inflamed or ulcerated area of this type will cause bleeding and increased ulceration. Likewise, a liquid stool with its upper intestinal content is very irritating and causes

these patients discomfort. Every effort is made to keep the stool free of fluid but slippery enough to avoid trauma.

The rectum should be kept empty and clean as much of the time as possible. This can usually be facilitated by using an irrigation of plain warm water after each movement of the bowels. Mineral oil as a laxative should never be used because of the tendency to seep into the rectum causing constant fecal soiling. The use of analgesic suppositories such as diothane or surfacain often helps. The instillation of 5 cc. of one of the preparations containing an anesthetic agent in oil has been found to be very useful when applied two or three times daily to control pain.

If there is considerable necrosis, 5 to 10 cc. of furacin solution is injected daily to be retained all night if possible. This causes resolution of the necrotic material.

If there is a tough slough which is slow to separate, careful desiccation of the fibrotic strands is done with the fulgurating electrode. Judicious fulguration is effective in controlling bleeding if from distinct granulating areas.

Intestinal motility and secretion should be kept at a minimum. A combination of belladonna and phenobarbital in such amounts as the individual tolerates is satisfactory as an intestinal sedative.

Colostomy has no place in the treatment of any except those cases with obstruction or uncontrollable hemorrhage and as a preliminary treatment of reconstructive surgery, such as the repair of a rectovaginal fistula. In fact, diversion of the fecal stream encourages contracture and finally obliteration in the inflamed rectum or distal sigmoid. Babcock in discussing the paper on this subject by Randal and Buie said that a radiation burn was a precancerous lesion, and he recommended excision with a graft of normal tissue, thus eliminating the possibility of a secondary carcinoma in the rectum. In 1946 Ricketts reported the use of radon ointment in the treatment of seven cases of this condition with satisfactory results.

Todd reported seven cases of severe perirectal type of reaction with intractable pelvic pain in which he did a presacral neurectomy. He also did a colostomy on five of these cases. The procedure was followed with satisfactory relief of pain and appeared to hasten the resolution of the pelvic fibrosis with healing of the ulcer from the increased blood supply.

Although the incidence of this complication appears to be declining, it is hoped that technic in the application of radium and high voltage roentgen therapy will become so standardized that this particular factor can be eliminated. My experience indicates that in many cases the incidence and severity of radiation proctitis varies with the experience of the man applying snch therapy.

One of our hospitals has provided for interval proctoscopic examination of the clinic patients receiving radiation therapy for carcinoma of the genitourinary organs, with a view to better resident training in the prophylaxis and treatment of this condition.

SUMMARY

Fifty-one patients with proctitis secondary to treatment of genitourinary cancer with radiation have been observed. Adenocarcinoma of the rectum developed in two patients who were experiencing symptoms from radiation proctitis secondary to irradiation treatment for an epidermoid carcinoma of the cervix.

In one case the epidermoid carcinoma of the cervix infiltrated the rectum. In another, adenocarcinoma infiltrated the bladder and rectum. Forty-two of the fifty-one are living and twenty are in good health, twenty-two have ulcer, stricture or contracture of the bowel.

From our experience and study of the literature we believe the following conclusions can be drawn: (1) The incidence of rectal complications from irradiation therapy of genitourinary cancer could be lowered by the standardization of the technic; (2) palliative treatment with diet and antibiotic drugs are beneficial; (3) colostomy has little effect on the course of the condition but is a valuable adjunct to the treatment of fistula and hemorrhage and (4) it is obvious that colostomy is indicated for obstruction but the rectum often obliterates after colostomy.

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DISCUSSION

Donald J. Pearson (Battle Creek, Mich.): Dr. Evans' talk has certainly been a careful review of the literature and has brought us up-to-date on a subject which can be a troublesome, trying condition. Furthermore, he has given us some down to earth principles of treatment which we can employ for the improvement and comfort of the patient. Also, the initiation of routine sigmoidoscopic examinations on all patients receiving irradiation for genitourinary malignancies should further our knowledge and information on the actual incidence of these rectal manifestations.

I should like to quote Dr. Gilbert Patrick, a well known radiologist in Michigan. "It is a firm belief among radiologists that, aside from accidents such as slipping of radium or inadvertent use of x-rays, most of the fistulas in the female pelvis, and especially those in which we are interested, (rectovaginal) are seen in patients who have had an extension of the carcinoma into the rectovaginal septum with the defect remaining after the cells have been killed by the treatment, and though these are definitely a complication of irradiation treatment, still these cells must be killed or no result could be obtained. The percentage of patients treated for pelvic carcinoma who develop a factitial proctitis of either the transitory or the permanent type, is to some extent dependent upon the care used in the distribution of the radiating source. Also, it is partly the result of some inherent factor which has to do with sclerosis of the blood vessels and this may in no way reflect upon the diligence used in the administration of the x-ray and radium. In a similar series of cases in the hands of equally competent men, the occurrence of these rectal changes will vary because of the difference of the individual patients. I think it is important to consider these sequelae as the more or less natural aftermath of treatment of pelvic carcinoma rather than as some negligence or incompetence on the part of the radiologist or surgeon. Time has proved that in unselected cases the method of choice for treatment of pelvic cancer is irradiation and not surgery, and to produce the best all-range plan for the greatest number of people, we must continue to expect rectal complications.

"With present surgical skill and operative techniques with which to combat post-radiation complications, no complications short of death of the patient due to radiation are too important to obviate original radiation therapy, if the cancer can be eliminated. One of the biggest factors in preventing these rectal complications should be brought out, and it is something which is almost entirely dependent upon the nursing care. Constant rotation of the patient during the time that radium is in place, to the right, to the left, and even on to the abdomen, allows the cervix and the fundus to change their position with regard to the rectum, and also increases the distance between these structures; distance is one of the big factors in reducing the amount of irradiation the rectum will receive. By constant, I mean every two or three hours, both day and night."

Durand Smith (Chicago, Ill.): Dr. Evans is to be commended for his timeliness in presenting this subject. In the last ten years the literature has been voluminous as far as radiation and atomic energy is concerned, but there has been a paucity of references as to the effect of radium and x-ray on the gastrointestinal tract. In a recent investigation at Wesley Memorial Hospital I found the rectum alone to be involved in 66 per cent; in the remainder the pathologic disorder was limited to either the sigmoid colon or the small bowel or both. The formation of fistulas was present in 46 per cent of the cases. Of these, 26 per cent were recto-

vaginal; the others were rectovesical, enterocolic and enterovaginal.

I do believe that if we are to cut down both the incidence of the delayed reactions and the morbidity which may follow radiation therapy, we must be energetic in our treatment of the acute reactions. A great deal can be accomplished by observing prophylactic measures.

ENRIQUE FIGARES (Havana, Cuba): I want to say that we use this radiation and emanation, 30,000 units and 2,000 in cod liver oil for two or three months. It is the same treatment used by Bonsorant in Paris for ulcerative colitis. We are using this with very good results in these cases.

ORVILLE T. EVANS (closing): I merely wish to say that there is no criticism at all in reference to the radiologist or the gynecologist in using and applying radium. I find by far the majority of my cases have been produced by the man who uses radium occasionally. It was with that in view that we set upon a program to train our residents in identifying and spreading the news that improvement can be had and benefit can be obtained by treating these patients.

# Papers Read by Title

## CONGENITAL ANOMALIES OF THE ANUS, RECTUM AND SIGMOID COLON AND THEIR SURGICAL MANAGEMENT IN INFANTS*

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EMBRYO and fetus pass through so many stages of development that it is not surprising that intrauterine life sometimes follows an atypical course and the infant is born with organs which differ from the normal pattern. Irregularities of form, structure or location may be encountered in any part of the human body, but the following considerations are restricted to congenital abnormalities occurring in anus, rectum and sigmoid colon. While the more spectacular forms of fetal malformations are rare, congenital anomalies of moderate extent are relatively common in the lower digestive tract and can now often be successfully treated by early surgical intervention.

Not quite a hundred years ago, in 1858, Henry J. Bigelow, who was professor of medicine at Harvard Medical School, remarked frankly, "Judging from results, I do not consider the operation for imperforate rectum or even imperforate anus, a desirable one. I believe that in the present state of the art it is better that a child born with either of these imperfections should die without this operation, although it must be occasionally performed in deference to established opinion."[9] However, in the meantime surgical technic has progressed to such a degree that through well planned operations and aided by chemo- and antibiotic therapy we are able to save the lives of many children with congenital anomalies of the lower digestive tract.

The statistical figures given for the incidence of these conditions vary widely. Some years ago it was estimated that congenital anomalies of the anus, rectum and sigmoid colon occur once in 5,000 to 10,000 newborns,[7] but more recent authors believe that an incidence of one in 1,500 might be more nearly correct.[10] Of late, Schapiro[14] found congenital anomalies of the anus and rectum at the ratio of one to 800 in 77,979 cases.

According to many authors, especially Bacon,[2] congenital anomalies of the anus, rectum and sigmoid colon are more frequent in male than in female infants. In a series of twenty-five cases from private practice reported by Harken[9] twenty-one of the infants were males, but the group is, of course, too small to give a reliable impression. Occasionally a familial tendency has been noted, as especially in the two cases of congenital microcolon, reported by ReBell.[12]

Many times congenital anomalies of anus, rectum and sigmoid colon are accompanied with other deformities, most often congenital heart disease, atresia of the esophagus, hypospadias, ectopic penis, harelip, and cleft palate, atresia of the small intestine, septate vagina, malformed vertebrae and absence of metatarsal bones, in order to name only those most frequently encountered. The concomitant presence of other congenital anomalies is of great importance for the life expectancy of the child. All too often the child dies of a coexisting but unrelated deformity after surgical correction of an anomaly of the lower digestive tract has been successfully accomplished.

The various congenital abnormalities of form, structure or location, encountered in the lower digestive tract, can conveniently be classified in the following manner:

The anus may be totally absent. In other instances the anus is of microscopic size or is covered or completely or partially occluded by membranous or fibrous bands. Sometimes the

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anus occupies an abnormal location, so-called ectopic anus.

The rectum may be totally absent or it may have been arrested in its descent. Occasionally the rectum opens into another viscus, namely, bladder, vagina, urethra or uterus. In these instances the anus may either be normal or absent. Duplication or triplication of the rectum are other congenital findings.

Congenital abnormalities of the sigmoid colon include atresia and stenosis, microcolon and megacolon. Duplication or triplication may be present but malrotation is by far more frequently encountered.

Before entering upon a discussion of the more important congenital conditions of the lower digestive tract, it may be helpful to review briefly its normal embryologic development and to indicate the aberrant course leading to various congenital anomalies. As it is impossible in the space of the allotted time to present the embryologic background of all congenital anomalies occurring in the lower digestive tract, it was thought advisable to describe merely some of the developmental deviations more frequently encountered.

*Embryology of Lower Colon and Rectum.* The crucial stages in the development of the lower digestive tract occur between five and nine weeks of embryonal life. (Fig. 1A.)

The allantois normally expands to form the primitive bladder.[1] Caudad to this region the minute continuation and extremity of the intestinal tract is known as the tailgut. As early as the third week the bladder and the hindgut empty into a common cavity called the cloaca which is separated from the exterior by the cloacal membrane. In the sixth week of embryonal life the urogenital sinus begins to develop. A wall of mesoderm covered by peritoneum grows downward between the urogenital sinus and the intestine, reducing the opening between the two systems to the cloacal duct. This finally becomes a fascial separation between the anterior rectal wall and the posterior surface of the prostate, seminal vesicles and bladder. The posterior layer meets with the external longitudinal coat of the rectum, known as the posterior layer of Denonvilliers' fascia, and is often composed of areolar or areolar and adipose tissue. The anterior layer extends from the peritoneum covering the upper portion of the pelvic organs and is fused with the prostatic capsule. This structure is designated as the anterior layer of Denonvilliers' fascia. It extends laterally around the areolar tissue, form-

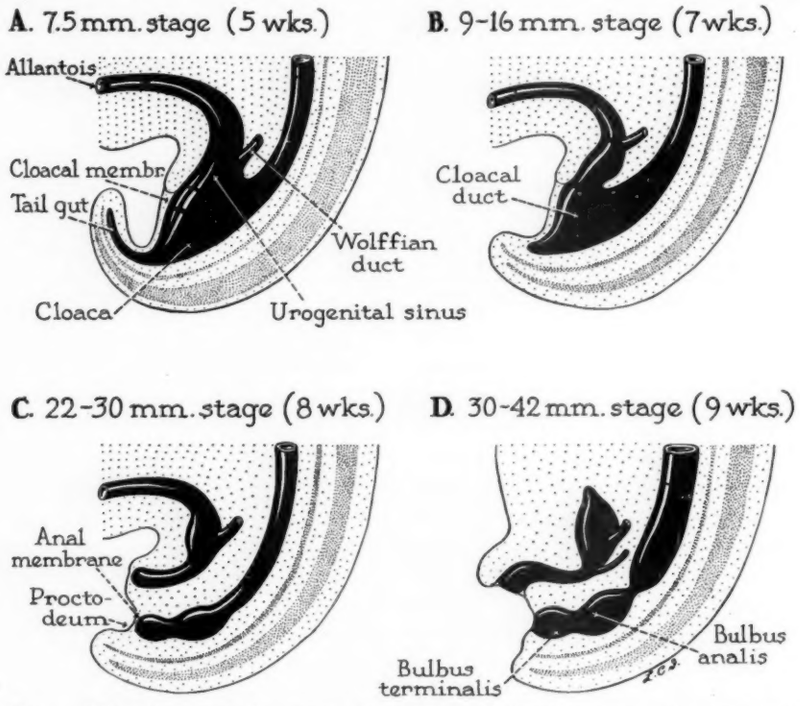


FIG. 1. The four successive stages in the normal development of the anus and rectum. (Modified from Ladd and Gross.)

ing the posterior layer of the upper part of the rectum, and together with the supra-anal fascia makes up the lateral ligament. (Fig. 1B.)

By the seventh week the urogenital and the intestinal systems have been separated by this fascia. The cloacal membrane is then divided into the urogenital and the anal membranes, respectively. About the seventh week the urogenital sinus has preformed an external opening which, however, is still closed by the anal membrane. By the eighth or ninth week the urogenital membrane breaks down to establish an external opening. In the region of the future anus an invagination of ectodermal tissue develops, which is known as the proctodeum. Normally, the anal membrane ruptures during the eighth week to establish continuity between the proctodeum and the upper anal canal. At this point any failure of the anal membrane to break down results in an imperforate anus.

Up until birth the rectum may present a spindle-shaped swelling, termed the bulbus analis. It has a position later occupied by the rectal ampulla in the adult. (Figs. 1C and D.)

*Embryologic Anomalies of Lower Colon and Rectum.* The union of the proctodeum with the hindgut, occurring at the mucocutaneous junction, follows a complicated pattern, and it is in this region that many congenital anomalies originate. The proctodeum may fail to invaginate, causing the anus to be entirely absent, or the rectum may not descend to a complete junction with the anus, leading to stenosis or an imperforate anus. Occasionally, arrest of the descent of the rectum coincides with normal invagination of the anus.

Invagination of the anus at an abnormal site results in an anomalous location of the anus which may coincide with total absence or arrested descent of the rectum.

Congenital fibrous bands often develop at the anorectal line where ectoderm and entoderm meet.[6] Such fibrous bands may result in complete, but more often in partial, occlusion of the anal canal.

If the urogenital groove is arrested in its downward growth, the intestinal tract will not be separated from the urinary system. Thus residual communicating fistulas will make their appearance. In male infants three types are distinguished, namely, the rectoperineal, rectourethral and rectovesical fistulas. In female infants rectovesical, rectovaginal and rectoperineal fistulas appear. Sometimes a misplaced or ectopic anus may be confused with a high fistula.

A review of the literature shows that there is no unanimity about the question whether a sphincter exists in cases of seeming total absence of the anus. Many surgeons who were unable to find any evidence of an anal sphincter during preoperative examination were surprised to learn upon microscopic study that a sphincter had actually been present. The anal sphincters are derived from the mesenchyme and are therefore independent in their development from the ectodermal and entodermal portions of the anus, rectum and intestine.

*Surgical Management.* In the following, diagnosis and surgical management of the more important congenital anomalies of the lower digestive tract will be discussed. In case of total absence of the anus or of total occlusion, whether membranous or fibrous in character, no meconium is present; and this sign is usually soon discovered by nurse or parents. The baby cries, is restless and vomits. Inspection demonstrates that there is only a slight depression where the normal anus should be. In the surgical treatment of total absence of the anus a simple anteroposterior incision over the normal site of the anus is advised. The underlying tissues are carefully incised by blunt dissection. Then the rectal pouch is located, brought down and anchored to each side of the newly formed anus. Great care will have to be taken in the handling of the actual, or rather the potential, site of the anus. The general principle of rectal surgery that the sphincter should never be divided in more than one place finds its special application in the operative management of these malformations. At birth the sphincter fibers are often very thin and poorly developed. Hence, early correction is advised, using the sphincter fibers which are already present. The operation should always be planned in such a manner that a sphincter, if present, may be preserved, as the final result will then be much more satisfactory.

In total occlusion of the anus the presenting symptoms are very similar as in absence of the anus. Upon examination, however, the finger can be inserted into the anus. In occlusion of the membranous type, the obstructing membrane can be felt with the palpating finger, and quite often insertion of the finger will complete the opening. Otherwise the membrane will have

to be incised. Subsequent dilatation is all that is necessary.

Incomplete occlusion of the anus is often due to congenital fibrous bands situated internally at the anorectal line. Coleman[6] found the condition in 9.3 per cent of children under one year of age and believes that this most frequently encountered congenital anomaly may be related to the development of fissures, fistulas, prolapse and hemorrhoids. At rectal examination the finger passes through the external and internal sphincters but is arrested about 1 to 2 cm. above the anal opening by a fibrous band or ring. Symptoms of the condition include refusal of food as well as vomiting but there may also be colic and constipation. Treatment consists of dilatation which may have to be repeated several times over. In some cases the fibrous ring or band tears during digital examination.

Partial occlusion of the membranous type can ordinarily be corrected by digital dilatation while in partial occlusion of the fibrous type excision is required. In all three conditions, total absence of the anus and total or partial occlusion of membranous or fibrous character, the degree of dribbling of fecal content is proportionate to the extent of occlusion. Usually meconium is absent and the presenting symptoms are very similar in all three conditions.

Differential diagnosis on the basis of digital palpation is confirmed by a roentgenogram of abdomen and pelvis. As suggested by Wangensteen and Rice[18] a metal marker should be attached to the anus or the potential site of the anus. The infant is held head downward and in this manner the rectal pouch as well as the distance between the pouch and the perineum will be outlined by the rising gas in the intestines. Bradford[3] suggests placing a small cork over the marker which is pressed in and held in position with adhesive tape. Browne[5] advises a delay of five minutes to allow the gas to rise in the thick meconium. In the interpretation of the roentgenogram it should be taken into consideration that during the first twenty to thirty-six hours of life gas may not yet have formed. As a rule, more accurate determinations can be made after the first day of life. Barium may be used but must be employed with great caution. It has furthermore to be considered that concomitant atresia of ileum or colon exists in some instances.

The surgical intervention required is determined on the basis of the roentgenogram. If the anal pouch comes down far enough, the communication can be established by a careful procedure combining cutting, retracting and palpating. In more complicated cases transversotomy and subsequent sigmoidostomy become necessary. Transversotomy is immediately performed. Between the third and fifth year of life the sigmoid and rectum are freely mobilized through an abdominal incision and transplanted to the anal margin. By this peritoneal approach the sphincter muscle is preserved and the bowel pulled through. Closure of the transversotomy is done later before the child reaches school age. The sacrococcygeal approach, which leaves the pelvic floor intact, is frequently used by Browne[4] and others. Proctologists, gynecologists and general surgeons have come to appreciate the advantages of this technic.

Abnormal location of the anus is a rare anomaly. The question here is to decide whether sphincteric control of this opening exists and how far the anus is removed from its normal location. If it is situated in an awkward place, and not under sphincteric control, anus, anal canal and rectum should be freed and transplanted to their anatomic position.

*Congenital Fistulas.* Opening of the rectum into another viscus is the most frequent of all congenital malformations, accounting for about 50 per cent of their total number. In rectourethral fistula, which is more common in male infants, the diagnosis is made by the symptom of fecal matter passing through the urinary meatus. Similarly, a rectovesical fistula leads to greenish discoloration of the urine, with absence of feces through the normal site. In the roentgen diagnosis of these conditions injection of 12.5 per cent sodium iodide, lipiodol or 20 per cent diodrast into the external opening has proved helpful. Infections such as cystitis or pyelitis will soon make their appearance. Under these circumstances early surgical intervention is imperative. In cases of this type the rectal pouch has usually descended to a low level, facilitating colostomy. According to some authors this operation carries a very good prognosis while others report a high mortality rate due to incident technical difficulties. Again transversotomy is the wise choice, with repair performed before school age. At that time the communicating viscera are separated by abdominal exposure and each opening is in-

vaginated and properly closed. The rectal route is used to bring down the rectal pouch to the anus.

Rectovaginal fistula is often associated with imperforate hymen and the presence of fecal matter may remain unnoticed for twenty years. Surgical intervention is indicated but there is no unanimity concerning the time when it is best performed. If the vaginal opening is sufficiently large to permit passage of intestinal contents, some authors suggest that the operation be postponed until the third or even the fifth year of life. Primary colostomy has been recommended with subsequent dissection of the fistula, combined with proctoplasty. The limited time at our disposal does not permit description of the details of this technic. It should, however, be mentioned that ReBell has developed an ingenious procedure which will soon be reported.[13]

Atresia and stenosis of the sigmoid should be clearly distinguished. Atresia is defined as closure of a normal opening or canal, as for instance the anus, vagina, auditory meatus or the pupil. Stenosis, on the other hand, constitutes a constriction or narrowing, especially of a channel or an aperture, such as aortic stenosis or pyloric stenosis. Use of the word stricture should be avoided, as it applies generally to narrowing as a result of inflammation.

Many theories have been advanced as to the cause of atresia and stenosis of the sigmoid, especially defective intestinal rotation, and unsuccessful attempt at recanalization. Vomiting and absence of fecal material are observed, together with the usual symptoms of obstruction. Roentgenographic examination is indicated. Surgical intervention must be performed immediately and, depending upon the mobility of the sigmoid, will either consist of an anastomosis around the obstruction or a Mikulicz operation.

Duplication or triplication of rectum or sigmoid colon are rare and usually not diagnosed before autopsy.

Microcolon is a comparatively rare condition, especially when only congenital narrowing of the sigmoid colon is taken into consideration.[12] The true cause of this developmental aberration has not yet been established, and in extreme cases the lumen is reduced to a diameter of not more than 4 mm. The infant passes urine but no feces and refuses to take nourishment. There is vomiting which may become persistent and also increasing abdominal distention. Rectal examination usually fails to reveal any abnormality, but upon sigmoidoscopy an obstruction at or above the level of the rectum may be discovered. Barium enema followed by roentgen examination shows characteristically that only a thin trickle of the contrast medium passes in the direction of the large intestine. Early surgical intervention is necessary in order to save the life of the infant and ileostomy is the procedure of choice.

Megacolon, also known as Hirschsprung's disease, is probably in all instances of congenital origin. It has, however, been demonstrated that chronic or intermittent deficiency of vitamin $B_1$ plays at least a contributory role in the development of the disease in adolescents and adults.[8] Cases in which the disease appears in infants (true megacolon) have therefore to be distinguished from others where it develops during childhood or in adult life. Lockhart-Mummery[11] reported a series of 100 cases of megacolon in which the condition was observed only twenty-four times in patients below the age of five. Many theories have been proposed concerning the origin of this condition but no single one has been generally accepted. Recently Swenson and his co-workers[16,17] demonstrated that dilatation and hypertrophy of the proximal segment of the colon are due to absence of peristaltic waves in rectosigmoid and rectum which in turn produce partial colonic obstruction. This malfunction can in some cases be traced to congenital absence or abnormal distribution of the ganglion cells of the myenteric plexus in the spastic portion of the colon.

The presenting symptoms of megacolon are enlargement of the abdomen, obstinate constipation and sometimes diarrhea. Physical examination reveals a protruding abdomen with thin, tense and shiny skin. No obstruction in anus or rectum is encountered upon inspection. A plain roentgen film of the abdomen gives evidence of a markedly dilated colon. However, in order to demonstrate the characteristic narrow and irregular outline of rectum and rectosigmoid it is necessary to place the patient in the oblique position and to let the barium mixture run slowly and in small quantities into the rectum. Barium enemas have to be used with caution as the patient may be unable to expel the medium. Conservative treatment consists of administration of parasympathomimetic drugs, dilatation of the anus, colonic lavage and

prescription of a nutritious, low residue diet. Especially dilatation of the anus will sometimes remedy the condition but more often surgical intervention is required. Cecostomy, colectomy or sympathectomy was considered until recently the treatment of choice but was mostly attended by inconclusive results. In a series of fifty-two patients Swenson[15] reported relief of symptoms by use of a special pull-through type of anastomosis. Following suprapubic incision the sigmoid loop is mobilized and rectosigmoid and rectum are resected down to the internal sphincter. A second team then delivers the closed end of the rectosigmoid through the anus.

Volvulus of the sigmoid colon is not strictly a congenital condition but a long flexure together with a mesentery on a short base of attachment, or on the other hand megacolon, predispose to this type of intestinal obstruction. Volvulus is uncommon in children and extremely rare in infants, and is due to malrotation.

## SUMMARY AND CONCLUSIONS

In conclusion it should be stressed that a thorough rectal examination of the infant during the first few hours after birth is necessary in order to discover any possible existing anomalies of the anus, rectum and sigmoid colon. A thorough anorectal examination, furthermore, should always be performed when a healthy-appearing infant, whether breast or bottle fed, develops any type of colic or constipation which fails to respond to a carefully directed diet.

Congenital anomalies of the anus, rectum and sigmoid colon are the result of an arrested or perverted embryonal development. However, through appropriate measures immediately applied it is often possible to preserve the infant's life and to establish anatomic relationships which often approximate the normal. As a general rule surgical intervention will be required and the procedures most useful in the management of the various conditions have been described in the foregoing. The aim should always be to preserve or establish good rectal control. The anal sphincter is only in exceptional cases totally missing, even when it cannot be clinically demonstrated, and the possible existence of a microscopic opening should always be kept in mind. Operations should therefore be planned so that existing muscle fibers will be preserved. In the majority of cases the operative result is gratifying and incidental mortality has been greatly reduced, especially through the use of the sacrococcygeal approach, and is now primarily due to associated congenital conditions. While the over-all incidence of congenital anomalies of anus, rectum and sigmoid colon is not high, they constitute problems of great interest and, whenever encountered, a major challenge to the rectal surgeon.

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# UNUSUAL FOREIGN BODY IN THE COLON

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*Philadelphia, Pennsylvania*

MRS. K. G., age fifty-two, was subjected to an abdominoperineal resection of the rectum with the removal of the entire posterior wall of the vagina and wide excision of the skin of the buttocks, for an extensive basal cell carcinoma of the anus on June 30, 1948.

On February 28, 1950, while taking her daily enema through her colostomy the patient stooped to pick up something which had dropped on the floor. The rectal tube slipped off the glass connector and was completely retracted into the colon.

The patient was admitted to the Jewish Hospital on February 28, 1950. An attempt to withdraw the rectal tube through the colostomy was unsuccessful. The patient failed to pass the tube with the aid of a laxative diet and mild laxatives. A flat plate of the abdomen was taken on two occasions to determine the position of the tube. The patient was prepared for surgery. On March 4, 1950, the abdomen was entered

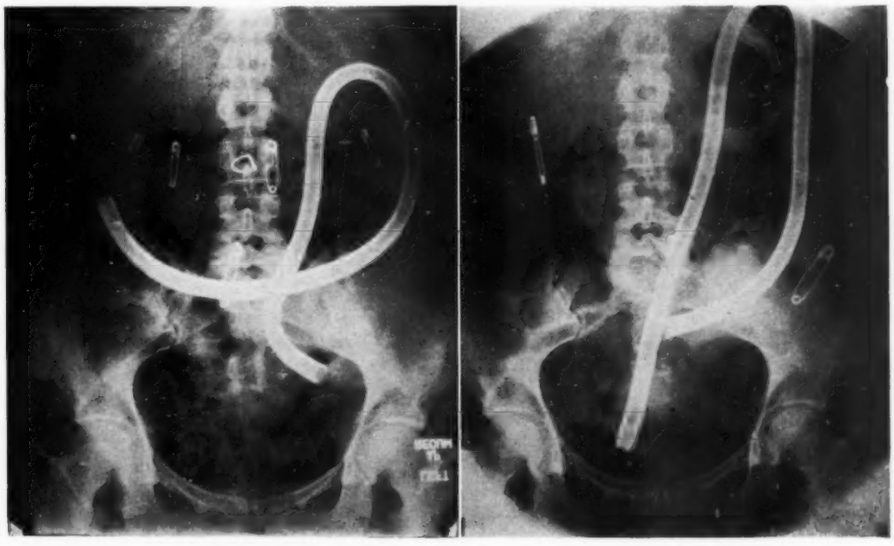

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FIG. 1. Flat plate of the abdomen on February 28, 1950.
FIG. 2. Flat plate of the abdomen on March 4, 1950.

FIG. 3. Rectal tube with hygeia nipple in place.

through a left rectus incision above the colostomy. The colon was grasped and the tube was milked down to the colostomy. An assistant inserted his finger into the colostomy until he could feel the tube. Guided by the finger, the tube was grasped with a hemostat and was withdrawn without traumatizing the mucosa of the colon. The abdomen was closed in layers and a subcutaneous rubber drain was inserted. The tube was soft, being the same tube with which she started her colostomy life in June, 1948. (Figs. 1, 2 and 3.)

COMMENT

Since this episode I have instructed all my colostomy patients to discard the rectal tube before it becomes soft and to use a rectal tube that is drawn through a hygeia nipple for a distance of 4 to 6 inches.

The nipple rests against the colostomy during the enema preventing the entrance of more than the protruding 4 to 6 inches of the rectal tube into the colon. Prophylaxis is better than treatment.

# SIGNIFICANCE OF THE ANAL GLAND*

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*Detroit, Michigan*

THE comparatively recent work on the tubulo-acinar structures at the anorectal junction, the so-called anal glands, is indeed interesting. The fact that these structures were described in 1880 by Hermann and Defosses, who also suggested their possible role in the development of perianal infections, apparently has escaped the attention of many writers on the subject of anorectal diseases. Indeed, the subsequent independent investigation of these structures by Harris, Tucker and Hellwig, Pope and Gunn, and others has been slow to reach current texts on proctology.

It is because of the lack of a sufficiently widespread appreciation of the significance of the anal glands that we feel justified in reviewing briefly the current thought on this subject and recording the results of our own investigations. We were further stimulated to do this by a recent case in which a carcinoma was found arising from an anorectal gland.

The report by Tucker and Hellwig, before the American Proctologic Society in 1933, initiated the renewed interest in this subject. These investigators were apparently unaware of the studies on the tubulo-acinar structures which had preceded theirs by many years. Especially noteworthy is the report by Johnson.[5]

Tucker and Hellwig studied clinical material histologically and found that in cases of cryptitis the inflammatory process involved simple or complex epithelial lined ducts showing various stages of reaction and that these ducts could, on serial sectioning, be shown to open into the crypts of Morgagni. They noted that the crypts of Morgagni were not involved *per se*. These investigators were unable to find typical glandular acini in the human material which they studied.

Comparative anatomic studies by Tucker and Hellwig revealed that well developed glandular components of these tubular structures occurred in rabbits, cats and dogs. Their studies on human embryos and newborn infants convinced them that these were preformed structures, probably vestigial in nature.

Subsequent reports by other authors[3,4,6–8] served but to amplify these findings. Several conclusions can be drawn from the combined studies, namely, that these tubular and at times acinar structures in the human are (1) preformed, (2) frequently the site of inflammatory reactions of varying degrees, (3) possibly the focal points for cryptitis and its sequelae, (4) of varying length and direction and extend into the submucosal layer in some cases, and to and through the internal sphincter, external sphincter and levator muscles in others, (5) lined with stratified squamous and transitional epithelium in the simple tubular forms and by columnar and low cuboidal epithelium in the more complex glandular forms, (6) sometimes mucin producing although no secretory activity has been demonstrated, (7) analagous to the deep intramuscular glands found in certain other locations of the intestinal tract, such as the esophagus, (8) subject, although rarely, to tumor formation.

## MATERIAL FOR STUDY

Material for study was obtained from two sources, one from surgical specimens (thirty cases) and the other from necropsy material (sixty-three cases). The surgical specimens were from patients whose ages varied from nineteen to sixty-two years. The necropsy material was divided into two groups. One group (twenty-seven cases) consisted of fetuses from four and one-half to nine months' gestation and the other group (thirty-six cases) consisted of infants and adults varying from nine and one-half months to eighty years of age.

## METHOD AND FINDINGS

The necropsy material was removed as a conical block dissection of the anal area and included the perianal skin and approximately 1 or more inches of rectum above the pectinate line. From the cones thus removed the twenty-seven fetal specimens were blocked transversely at four levels and appropriate sections were cut. From the thirty-six specimens of children and

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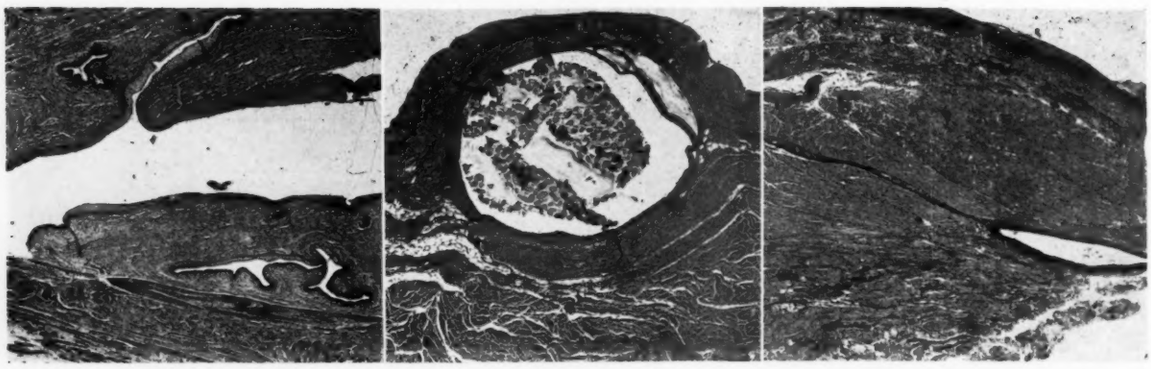

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FIG. 1. Transverse section of anal tissue; in the upper section are a crypt and an anal duct and in the lower section a branching anal duct, × 25.
FIG. 2. Cyst formation in the sphincter muscle probably owing to duct occlusion, × 25.
FIG. 3. One of the serial sections taken to prove non-canalization of an anal duct with a cystic area, × 25.

adults four to eight longitudinal blocks were obtained, depending on the size of the specimen. The thirty surgical specimens were all sectioned longitudinally. All tissues were stained with hematoxylin and eosin and those with glandular elements with Best's mucicarmine stain in an attempt to demonstrate secretory activity.

The findings in the surgically removed specimens (thirty cases) were as follows: There were thirteen in which ducts were demonstrated; in three of these acini were also found. Five of the thirteen cases had some evidence of periductal, periglandular or intraductal tissue destruction, edema and leukocytic infiltration suggestive of infection. The ducts could be traced to their point of origin in the crypts of Morgagni in ten of the thirteen cases. The site of occurrence of the anal ducts was usually in the posterior area around twelve o'clock.

The findings in the necropsy specimens (sixty-three cases) were as follows: (1) in the twenty-seven fetal tissues studied there were twenty-one in which ducts were found and, of these, seven also had anal glands. In six of these twenty-one cases the continuity of the ducts with the crypts of Morgagni was demonstrated. (Fig. 1.) In one case we made transverse serial sections of the anal tissue and demonstrated seven areas in which ducts arose from Morgagnian crypts. (2) In the thirty-six specimens from infants and adults there were twenty-nine in which ducts were present and fourteen of these had anal glands as well. In twenty-three of the twenty-nine cases the ducts were shown to communicate with the crypts of Morgagni. Eight of the twenty-nine cases had evidence of infection in the ducts or glands and others had evidence of infection in the periductal and periacinar tissues. In two specimens the anal glands had an appearance suggestive of secretory activity, but no mucin was found with special stains. In several specimens there were cystic glands (Fig. 2) which we believe due to failure of canalization of the ducts (Fig. 3.)

Both adenomas and adenocarcinomas of these glandular structures might be anticipated but apparently are rare. Scarborough has reported one case of a primary carcinoma in this area which he interpreted as one arising in these glandular structures. This adenocarcinoma was a highly malignant one which metastasized to the liver and brain.

The case we report apparently has a less malignant lesion of a similar type.

## CASE REPORT

The patient was admitted to Providence Hospital on the service of Dr. Charles Burgess. He was a sixty-four year old white male who for one and a half years had had moderate rectal bleeding which was exaggerated for the month prior to hospitalization. On examination he was normal except for the anorectal area. Large internal and external hemorrhoids were present and in one of these there was a firm nodule which gave the impression of a thrombosed hemorrhoid undergoing necrosis.

Laboratory and roentgenographic studies were normal.

An amputative type of hemorrhoidectomy was performed and the firm nodule was widely excised.

The material submitted for examination

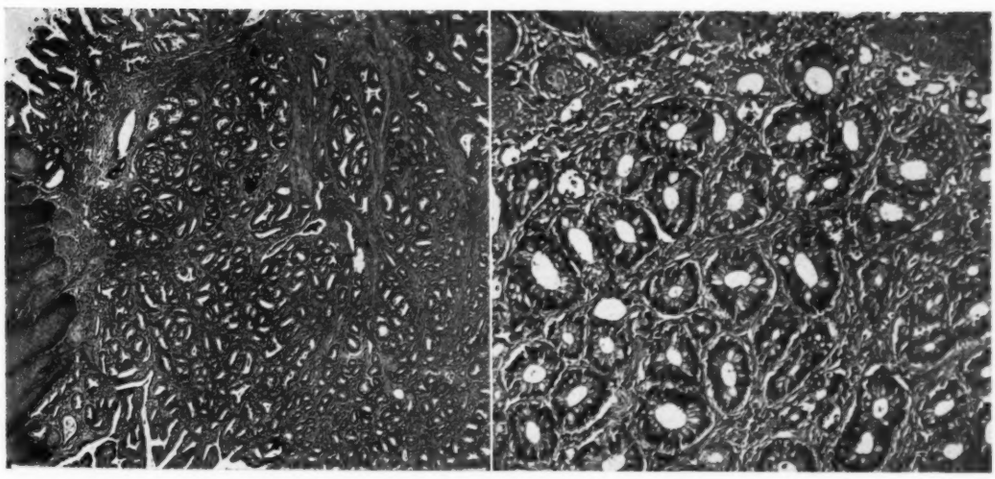

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FIG. 4. Anal gland adenocarcinoma, × 25.
FIG. 5. Anal gland carcinoma with some suggestion of secretory activity, × 90.

consisted of three segments of highly vascular mucocutaneous tissue. The largest specimen measured 1 cm. in diameter, was firm, fibrous and was grayish brown after section.

Microscopically two of the specimens were of typical hemorrhoidal tissue and the third larger mass was of an entirely different character. In this tissue the superficial squamous epithelium was partially lost. Beneath the epithelium there was an adenomatous neoplasm. (Fig. 4.) The glands were lined by low cuboidal epithelium reminiscent of the epithelium of the perianal glands. In some of the cells there was a suggestion of mucin production but no such material could be found after special stains. (Fig. 5.) The stroma of the tissue was edematous, loosely arranged and highly vascular.

Our impression was that this represented an adenocarcinoma of the perianal gland type.

Postoperatively this patient had an uneventful convalescence and was discharged from the hospital on the fifth postoperative day. Because the area involved by the tumor was small, the adenocarcinoma of a low degree of malignancy and the involved tissues widely removed, it was believed that the operation had been adequate. The patient has remained well in the two years since his operation and has had periodic examinations.

## SUMMARY AND CONCLUSIONS

We have presented a study of the tubuloacinar structures of the anorectal area of ninety-three cases, the material consisting of surgical and necropsy specimens. Our findings are consistent with those of earlier studies reviewed in this article.

Our studies confirm the presence of these structures and indicate that they are present in fetuses and throughout life. The increased evidences of infection in our surgically removed tissues (38 per cent) over that of our adult (27 per cent) and infant (0 per cent) necropsy material suggests that infection of these structures may lead to other pathologic change in this area. We were unable to demonstrate any secretory activity in those specimens in which glands occurred.

In addition, we report a case of adenocarcinoma arising from an anal gland. We believe this to be the second case of primary carcinoma of this type to be reported.

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# Scientific Round Table Discussion

QUESTION: Should cecostomy be chosen for decompression in left-sided colon obstruction?

ANSWER BY DR. RICHARD B. CATTELL (Boston, Mass.): We should preface any remarks relative to obstruction in these cases by speaking of its incidence. Obstruction to a degree requiring initial operative intervention will probably be necessary in only 3 per cent of all cases. Whether you perform cecostomy for left-sided lesions or colostomy of the right half of the transverse colon makes little difference, provided the cecostomy is performed in a satisfactory manner. We prefer cecostomy for the relief of these serious obstructions. If cecostomy is utilized, the parietal peritoneum is entered, the cecum is rotated well up into the abdominal wall and at least a third of the circumference of its antimesenteric edge is brought outside beyond the skin. Cecostomy permits immediate decompression; it does not accomplish complete diversion. If complete diversion is desired, colostomy of the right half of the transverse colon should be performed. If operation is not necessary, all cases in which some degree of obstruction is present should be decompressed, with intubation for the first thirty-six hours. Perhaps in many of the patients with low lesions a tube can be introduced through the proctoscope beyond the malignancy and then initial operative decompression is not necessary.

QUESTION: How do you treat intractable, incurable pruritus ani?

ANSWER BY DR. LOUIS J. HIRSCHMAN (Detroit, Mich.): I really can make this answer very, very brief. You can give the patients symptomatic relief, with due respect to the gentlemen who spoke this morning, by a complete and thorough undercutting operation. I mean by that complete and thorough. Undercutting has had a bad reputation with some people because the undercutting was not complete and thorough. However, I do believe that when you have intractable and incurable pruritus ani you have not only the right but also the duty to palliate that patient as much as you can. Surgically I would do just that and medically I would give him such sedation so he could sleep nights. I think that is what I would want done with me.

QUESTION: Is it better to use the electric snare or fractional fulguration for adenomas above the peritoneal reflection?

ANSWER BY DR. GARNET W. AULT (Washington, D. C.): The advisability of treating adenomas above the peritoneal reflection remains in the hands of the individual and his skill and technic in taking care of the lesions at this level. The fractional fulguration, which is largely the use of the Oudin monopolar current, is a very valuable procedure. It dries up your specimen and with biopsy preceding it you will get a pretty good idea of what lesion you are dealing with. On the other hand, if your colleagues insist they would like the entire specimen for the pathologist and if you have an accessible lesion with a satisfactory pedicle and can perform a diathermy snare excision under favorable circumstances (under good vision, good lighting), I believe the procedure of choice to obtain the entire lesion, to send the entire specimen to the pathologist, is diathermy snare excision. Then you know what you are dealing with.

I am sure the individual who asked this question had in mind the possibility of perforation. The immediate recognition of perforation under these circumstances is the responsibility of the physician who just took care of that adenoma. Although it does occur in a few instances, the frequency is not great. It is a definite hazard—diathermy snare excision as opposed to fractional fulguration.

QUESTION: When is a contrast study indicated for polyps?

ANSWER BY DR. PAUL C. SWENSON (Philadelphia, Pa.): I will answer that question by saying always. It is true one seldom fails to see a polyp of fair size under fluoroscopic control but, of course, one always wants to turn to both the conventional enema and the double contrast to demonstrate further this particular polyp. However, there may be smaller ones and one always wants to go ahead with the entire colon to see whether there may be more than one. There is no effort too great to give in demonstrating polyps, in my opinion. Examination of the colon is always a tedious and time-consuming affair; one must be very careful not

to miss the smaller polyps when one has shown others.

QUESTION: Where should the colostomy be placed in doing a one-stage abdominoperineal excision of the rectum?

ANSWER BY DR. E. PARKER HAYDEN (Boston, Mass.): I think that is largely a matter of the individual surgeon's preference. Personally, I make a left paramedian incision, which is about 1 inch at the left of the midline, and I bring the colostomy out in that incision at such a point that the mesenteric border comes directly up to the abdominal wall. That seems to provide the maximum amount of bowel outside without tension.

If the colostomy is constructed through a stab wound on the left, I think it is important to close the lateral aperture which is smaller. However, I do not think it is necessary with a colostomy near the midline. If one is to use a pouch, which most of us do not think is either necessary or desirable, there is more point in having the colostomy nearer the middle of the abdomen where the pouch will lie flat on the abdominal wall. I would like to emphasize that I do not believe in colostomy pouches.

QUESTION: What action is indicated in the case of a polyp which after removal reveals adenocarcinoma in the tip only?

ANSWER BY DR. ROBERT A. SCARBOROUGH (San Francisco, Calif.): And I have been asked to be brief! It is pretty difficult. That is a tough problem for me and every patient I have, as it is for everyone. The decision as to treatment depends primarily on the differentiation of diagnosis between a benign and a malignant lesion.

I think in these, as with somewhat larger lesions, we can still depend on the statement that the late Tom Jones used to make many times, that the smaller the carcinoma, the more radical should be the resection because in that patient you have the greatest opportunity for permanent cure. We have no hesitation at all now as a routine in polyps that are removed by laparotomy and colotomy and found to have some malignancy in a benign adenomatous polyp, even with a pedicle, to carry out segmental resection as radically as we would for any carcinoma.

Frankly, we are not prepared to proceed as radically as a routine with polyps that are low in the rectal ampulla where such a resection would require permanent abdominal colostomy. In those patients we make an individual decision. We try to calculate and balance the risk between local excision and more radical surgical extirpation, including in that decision, of course, as a weighing factor the necessity for permanent abdominal colostomy.

If a pedunculated polyp in the rectal ampulla is by and large benign and has a small area of malignancy on the tip which invades the stroma of the polyp but does not invade beneath the muscularis mucosa, we believe it is justifiable to perform only local resection. But if the tumor is not pedunculated or if there is definite invasion through the muscularis mucosa, we believe the patient should have radical resection.

DR. CATTELL: I would like to enter the discussion at this point, Mr. Chairman. We do not differ in the point of view that Dr. Scarborough has just given. There is only one thing I would like to warn against. Without question, the members of this group have 700 or 800 different pathologists reporting these polyps. If you are going to perform an abdominoperineal resection on the basis of perhaps inadequate study of the histologic structure of the tumor, many resections will be performed in cases in which other pathologists, perhaps of greater experience, would not make the diagnosis of malignancy after histologic study. I think that was evident in one of the discussions today in a classification of adenomatous lesions of the bowel. We must be sure that we are dealing with carcinoma if we are going to assume a radical attitude toward it.

QUESTION: What are the indications, if any, for the Whitehead operation?

ANSWER BY DR. AULT: No indications.

QUESTION: How accurate is the x-ray in demonstrating colonic polyps?

ANSWER BY DR. SWENSON: That question cannot be answered categorically because we do not check up on every one of the cases. In other words, we do not know how many we do miss of the smaller polyps. I can only say this, that a lot depends upon the patience and zeal of the particular examiner.

My own figures, if you will pardon me, are rather high for the very reason that we do not stop with the first examination. If there is bleeding, we re-examine and keep at it. I think that I am justified in saying that our batting average is high because, as you all know, there is no mistake that is publicized faster than the

radiologic error. The surgeon calls the radiologist the next day or the radiologist is standing looking over the surgeon's shoulder at the time he is demonstrating his error to him.

Therefore, although I cannot answer the question with a percentage figure, I am fairly certain that with reasonable care and with the methods we have now we can demonstrate most of the polyps.

DR. AULT: May I ask a question? Dr. Swenson, would you recommend that the colon be explored when you have demonstrated a polyp only once by radiographic examination?

DR. SWENSON: By no means. I think we must repeat the examination twice. That is to say, we must start from scratch at two different examinations to show the polyp in order that we can be careful and accurate and tell the surgeon just where to go.

CHAIRMAN BACON: I should like to ask Dr. Swenson a question, particularly because I think it is of general interest to those in the audience. I would like to ask Dr. Swenson what he feels is the most adequate preparation of a patient for barium enema.

DR. SWENSON: Provided there are no contraindications clinically (I might say parenthetically that when there is contraindication the procedure I am going to ask for usually is not necessary, anyway), I would like to have in any case in which we are looking for polyps a good purge the day before; a saline purge or a castor oil medication followed with an enema the next day, the morning of the examination.

Now, then, if and when they find the preparation is not perfect, a lot of radiologists are unhappy and always are complaining about the patient and the referring physician not cooperating. It is very easy to send those patients back and forth to the toilet until you are certain you have the proper amount of cleansing effect. I find in most of my referred outpatients that they come unprepared. My first barium enema is a cleansing enema, so we just keep on "fooling around" until we get the proper amount and mixture of barium and air we want. By the way, I use no fancy mixtures. Just a little common sense with the usual barium and water mixture will give you anything you are after.

QUESTION: What is your present opinion as to the best surgical procedure for complete prolapse of the rectum?

ANSWER BY DR. HAYDEN: I am very glad to answer this question because two years ago at the meeting in Columbus I had the opportunity of discussing a paper that Lawrence Abel gave. As you probably know, in England surgeons have been prone to perform circular amputations of a complete prolapse, with suture of the inner and outer tubes of bowel. I can recollect many years ago when Mr. Miles reported thirty-two cases of complete prolapse of the rectum amputated, with no mortality or possibly one death. I thought that was extraordinary in what seemed to be a very risky procedure and I was always afraid to try it. I had utilized, instead, the various procedures with which we are all familiar.

Several years ago I looked up a series of about sixty cases from the Massachusetts General Hospital. They were treated by twenty-two different surgeons and with almost as many different operations. It is obviously impossible to get figures from such a series, particularly when at that hospital only one or at the most two cases appeared in a year.

Since the meeting in Columbus I have had seven of these cases, and have performed amputation in all of them. I was astonished at how smoothly they came along. All patients recovered, and ran practically no fever, and there were no complications. Therefore, at the moment I am using that procedure, which is quite simple. It consists of cutting through the outer wall of the prolapse ½ inch or so outside the mucocutaneous junction, isolating the hernial sac in the anterior wall and dissecting it out just as in an inguinal hernia, ligating as high as possible, dividing the inner tube of bowel and suturing the cut ends of bowel in layers, and letting it recede. These patients evacuate spontaneously with mineral oil and have absolutely no pain. They hardly know anything has been done.

I think at the moment, therefore, that this is probably the best way to handle complete prolapse, although some of these cases may recur later.

QUESTION: Should a patient with an epithelioma of the anus—I assume that is a squamous cell rather than a basal cell—have radical dissection of the inguinal lymph nodes?

ANSWER BY DR. CATTELL: This lesion, of course, constitutes only 1 per cent of all of the malignant lesions of the large bowel. Unfortunately, it has the poorest prognosis of any tumor except melanin tumors of the large

bowel. For that reason it is necessary, we believe, to perform as radical an operation as can be done for any low rectal lesion. This should include abdominoperineal resection, with special attention paid to wide perineal and ischiorectal dissection and also bilateral dissection of lymph nodes of the groin.

We cannot support this belief statistically nor have we seen it supported in the literature by actual figures because the five-year survival rate in our experience is approximately 20 per cent, which is the lowest of any of the cases that we see. However, because of its poor prognosis we believe that the combination of abdominoperineal resection plus the removal of lymph channels—that is where epidermoid lesions spread more quickly and more often—should constitute the operation of choice.

QUESTION: Is one justified in removing the entire colon for multiple polyps suspected to be malignant?

ANSWER BY DR. SCARBOROUGH: I think that we are not only justified in totally removing all mucous membrane involved by polypoid disease, but also it is our responsibility to do just that. I assume that total colectomy here means inclusion of resection of the rectum. That certainly we do not want to do unless there is already malignancy present in one or more of the polyps in the rectal ampulla.

The most common procedure in such patients with no malignancy present is the destruction or removal of all polyps in the rectal ampulla within reach of a sigmoidoscope, followed with resection of the rest of the colon and end-to-end anastomosis of the ileum to the upper rectal stump.

It is most important when that has been done to acquaint patients with the fact that in all probability more polyps will recur or develop in the rectal stump and that they must be followed carefully and frequently so that such polyps can be destroyed or they may in turn become malignant.

There is a procedure, recently suggested by Doctor Ravich of Baltimore, for stripping the mucous membrane of the rectum and preserving the musculature of the rectal ampulla, the sphincters and the anal sphincter mechanism, and pulling the ileum down through that denuded rectum. Whether or not that procedure will be as successful as some of the early cases have made it appear is, in my mind, somewhat questionable. Removal of the complete colon by preservation of a few inches of rectum results in practically normal bowel habits. Certainly the procedure should be undertaken before malignancy develops.

QUESTION: In those fistulectomies performed in two stages in order to preserve the integrity of the sphincter should a seton be employed, and in what capacity?

ANSWER BY DR. HIRSCHMAN: A seton is merely used as a guide. It has no value *per se* as a seton. I prefer to call that a conservation loop. In the two-stage fistulectomy, regardless of whether there happens to be one branch of the fistula which encircles or perforates the sphincter or whether there are several, I believe that all of the tissue involved, all of the fistulous lining, should be removed and the sphincter carefully exposed by dissection.

It has been our practice to incise from the internal opening half or two-thirds of the way to the sphincter fibers to the outer edge. We then place a loose loop of silk or silver wire in order to act as a guide post for the subsequent second stage. We have never, for years, completely divided the sphincter in any fistulectomy. We have had in no case incontinence from cutting the sphincter because the sphincter is never completely divided. The integrity of the sphincter is therefore preserved, because all the fibers are not divided at one time.

We find that many cases of sphincteric incontinence are not alone produced by surgery but because of injudicious overpacking in the postoperative care of the fistula.

In most of our fistula cases, unless it is an extraordinary fistula with many tracts and communications with other organs, the second stage of the fistulectomy is usually an office procedure under regional anesthesia. After we have placed this conservation loop or seton around the outer or front cut portion of the sphincter, the patient goes home in a few days if it is a simple case and the sphincter is allowed to heal from the wound inward to the canal. Sometimes the patient will come into the office with just that little loop hanging there and will ask, "Doctor, when are you going to take that stitch out?" That is the way it seems to them; some do not know it is there. Once in a while a patient will get hold of it and pull it out. Of course, no harm is done because that merely demarks the small, transposed remnant of the fistulous tract.

When the patients come into the office, a

little infiltration anesthesia is used to anesthetize the skin. The outer loop is removed and then the wound remaining is allowed to heal by granulation. We have found in no case in which we have used this loop technic—and in a few cases we have had several undermining fistulous tracts and have treated each one in the same manner—have we interfered with the integrity of the sphincter.

QUESTION: Is an anorectal examination complete without x-ray of the colon?

ANSWER BY DR. AULT: I believe that question implies that the barium enema and/or gastrointestinal series is indicated as a part of the study in all patients who come to you with anorectal disease. If it is a practical thing to give a barium enema and follow this with a gastrointestinal series, I think it should be done. Of course, economics enter into this.

On the other hand, most patients with disease of the colon will have concomitant anorectal disease. If you wish to be thorough about it, it certainly is a decided advantage to have every patient with anorectal symptoms have, first, a proctoscopic examination, secondly, a barium enema with air contrast and, thirdly, a gastrointestinal series. That means that you have undertaken a thorough gastrointestinal investigation of your patient. It is the best way to do the examination. Whether it is practical and economically sound is something else that would require long debate.

DR. CATTELL: Mr. Chairman, I would like to pose something somewhat radical for Dr. Swenson's comment. Would it not be wise for all roentgenologists when private patients are referred for barium enema who have not had sigmoidoscopy to refer them back with the biting comment that sigmoidoscopy should be done first? Do you think you could make a living?

DR. SWENSON: Yes, I think we could, Dr. Cattell. I have had many an urge to do that. It is very, very embarrassing and distressing to us to do a simple digital examination before we give the enema and find the condition is initially a large rectal mass which should have been discovered before the patient was ever sent to us.

As far as we are concerned, we do not believe that the radiologist should be held responsible for ruling out disease in the rectum; that is *not* his province. I believe that no sort of x-ray procedure could ever take the place of direct inspection and I do not think that you fellows should ever expect us to be the last word in examining the rectum.

About referring the patients back, I think if you do that a couple of times it would be a very fine education for a physician, and I could always stand one or two episodes of that sort even if it boomeranged on me. I think that would be a very fine plan.

CHAIRMAN BACON: There is certainly an awful lot of meat in what Dr. Swenson said. He certainly deserves our heartiest congratulations.

DR. HIRSCHMAN: I just want to ask all the members of this audience to do one thing to help out both the roentgenologist and the proctologist. When you go home, you will be called upon to speak before county and state societies, and whenever you talk about a rectal examination, for heaven's sake, pound it in and pound it in that they should never send a patient to the roentgenologist under any consideration for a gastrointestinal series without making a proctoscopic and sigmoidoscopic examination first or without having it done. We can do a lot of good. We talk here among ourselves; we must spread it among the general practitioners who see the patient first.

DR. AULT: Dr. Swenson, do you think it would be an injudicious and unjustifiable procedure for the roentgenologists of this country to state in their reports of the barium enema or gastrointestinal series in the concluding paragraph, "This examination does not include the rectum and rectosigmoid"?

DR. SWENSON: I imply that in every one of my reports. When a patient is referred to me with a lesion already shown in his rectum by direct inspection, he is being referred to me for two reasons: first, to show the extent or the amount of involvement of the lesion of the rectum and, second, to see whether a double lesion exists because we do know that the day of the single lesion is past. In my reports, I simply say there is no lesion above the rectosigmoidal junction. Does that answer your question?

DR. AULT: That is a very fine point. I wish the roentgenologists would stick to it.

QUESTION: How do you manage patients with local recurrence?

ANSWER BY DR. SCARBOROUGH: Presumably this is local recurrence of carcinoma and not pruritus ani or hemorrhoids.

Local recurrence to be immediately local, I

presume again, would be at the line of an anastomosis. Regional local recurrence might be included here if they refer to recurrence of carcinoma in the pelvis, for instance, after a radical abdominoperineal resection. I believe that the opportunity to cure cancer by surgery is at the first operation and that the most radical possible procedure, the widest possible resection, should be carried out at that time. I do not believe there is ever reason for local recurrence of carcinoma at the line of anastomosis when carcinoma has been resected in the colon proper. Resection should be performed so far away from the tumor that there is no possibility of recurrence in the line of anastomosis.

The problem as to whether or not there is recurrent cancer does arise fairly frequently in patients who have had resection and anastomosis for carcinoma in whom symptoms of bleeding or change in bowel habits subsequently developed and in whom x-ray examination reveals some deformity at the site of anastomosis. If you are certain that the surgeon performed a very wide resection at the original operation and such occurs one, two, three, four or five years later, I think the assumption should be that if it is carcinoma it is a new carcinoma and not a recurrence of the original one, you should proceed with your necessary diagnostic steps and with exploration and anticipated resection just as you did in the original carcinoma and with as good a prognosis for cure.

QUESTION: Does an aseptic anastomosis have any advantages over an open anastomosis, or vice versa?

ANSWER BY DR. HAYDEN: There has certainly been more of a trend recently toward open anastomosis, at least around my neighborhood, and I am sure that is true over the country as one reads the literature. There is no question, I suppose, but that an aseptic anastomosis properly performed minimizes the amount of contamination that occurs. On the other hand, it is certainly true that, regardless of whether sulfa drugs and penicillin are used, it is perfectly possible to perform an open anastomosis carefully, with adequate preliminary preparations in respect to deflation and cleansing of the bowel without any untoward results. Safety measures include protecting the wound edges carefully with moist pads, packing off the other viscera well and avoiding gross spilling. The argument for the open anastomosis is chiefly that one can secure a more accurate approximation of the edges, with less turning in of the cuff. I think this is true, as contrasted with a basting stitch anastomosis or anastomosis over clamps. The important thing to emphasize, of course, is the fact that the success of intestinal anastomosis, aside from accurate suturing, is primarily dependent on two things: (1) a good blood supply and (2) avoidance of postoperative distention. That implies, to be on the safe side, proximal decompression.

CHAIRMAN BACON: I should like to ask Dr. Hayden if he prefers one or two layers and, if so, what types?

DR. HAYDEN: I have been in the habit of using an inner row of continuous No. 00 chromic catgut and an outer layer of interrupted silk. Much has been written about the fact that a single row of carefully placed silk is quite adequate, and I presume it is. It seems to me this is like a lot of other things in surgery; it is mostly a question of how the job is done on the individual patient, how carefully it is done, and whether you use one type of suture or another is really of secondary importance.

DR. CATTELL: Dr. Hayden, I have found in observation that a number of surgeons who use a single layer of non-absorbent material such as cotton and silk frequently re-enforce it all the way around to do the second layer.

DR. HAYDEN: I have been told that is true also.

QUESTION: What is the treatment of annular non-obstructive cancer grade 2 of the rectum about one-third of circumference and 1 to 2 cm. distal to the rectosigmoid junction?

ANSWER BY DR. CATTELL: This is a very easily answered question. The grade and the amount of circumference or any other degree of involvement are not of first importance. For all lesions from the mid-sigmoid down to the anus we think an abdominoperineal resection in one stage should be performed. We do not possess the acumen or the clairvoyance to be able to tell the extent of the involvement in carcinoma of this lower portion of the large bowel; and for that reason and because of the fact that 48 per cent show definite extension of various degrees, we follow the philosophy voiced by Dr. Scarborough that this is our chance. We will take it; we will offer the patient the greatest chance for cure, which we are able

to do by abdominoperineal resection for all cases.

QUESTION: Point out briefly the differential diagnosis between cancer and diverticulitis of the sigmoid.

ANSWER BY DR. SWENSON: That is a bit difficult to do briefly. I am going to mention that this afternoon. Briefly, and very briefly, there are five points. The first would be the difference in the mass; it would usually be tender in the case of diverticulitis and nontender in cancer. A relatively long segment would be involved in the case of diverticulitis whereas a shorter segment would be involved in the case of a tumor. Then the filling defect itself would usually show a shelving contour on either edge, a thing that can only be shown on a film.

Then, I suppose, one might mention the presence of diverticula as a lead to the diagnosis whereas their absence would make one more apt to think of cancer.

The next point, I think, is the most important. We are dealing with a patient in the fluoroscopic room. We will find that when we first start to administer barium and the ascending column hits the involved area in the case of an inflammatory lesion, the obstruction to the ascending column will be almost complete and the patient will say, "Oh, oh, I can't take any more." On the other hand, in a case of carcinoma, there will be at least some residual irregular canalization of the area which will allow for some barium to go by.

This obstruction which one sees as a general rule to the ascending column of the barium enema does not necessarily mean the patient is clinically obstructed because barium coming from above as well as the fecal stream will not be obstructed; it is the spasm associated with the inflammatory mass that will make it a complete obstruction to the barium enema.

DR. HIRSCHMAN: How often, doctor, do you use the stereoscopic radiography in your colon work?

DR. SWENSON: It is nice to have it. Harry Weber at the Mayo Clinic popularized that method of observing the mucosal pattern and I use it quite often. It is not absolutely necessary but it is nice to have and there is no reason why we cannot have it. I think we should have it whenever it is convenient.

QUESTION: At what age and by what method do you treat atresia ani vaginalis?

ANSWER BY DR. HIRSCHMAN: That is a question that would require considerable elaboration. I would say this: If the atresia is not of sufficient complexity so as to interfere with elimination, we prefer to dilate the opening right at recognition, even within a few hours of birth, and dilate it so that the patient can pass meconium and stool. We might let the patient go for a considerable time before we attempt any restorative measures. I realize some men are doing more radical operations.

If the atresia is of such a nature and there is no sphincteric musculature present that can be demonstrated, sometimes we do a colostomy pretty well up on the left colon and allow the patient to grow up until from two to six years old, before he is ready to enter school. We have had two cases of women who grew to adult life, both of them just below thirty years of age; neither of them knew until they grew up that they were different from other women. In both of those cases we were able to do restorative operations.

As a general rule, I believe unless you have atresia vaginalis, which very often is not a vaginal fistula at all but really a vulvar opening, the less you do at first, the better off you are if you can get sufficient drainage. However, until a child is grown to a weight of at least 40 pounds or more, I think reparative or corrective surgery should be postponed.

QUESTION: What is the best method of treating multiple polyps in the ampullary portion of the rectum?

ANSWER BY DR. SCARBOROUGH: I think that question we partially included in a previous discussion of polyposis. We have found it is possible to remove as many as 380 polyps from the lower 17 cm. of the rectum through a proctoscope at repeated sittings by electrofulguration of the sessile lesions and diathermy snare amputation of the pedunculated lesions. We continue with each individual treatment until the operator is tired and the patient is fatigued. In many cases it has been possible to remove fifty or sixty polyps at one sitting in somewhat less than thirty minutes. Then we like to have the patient wait a minimum of three weeks in order to let the inflammatory reaction subside before continuing with the next treatment.

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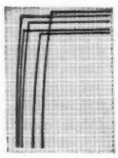

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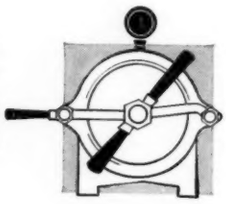

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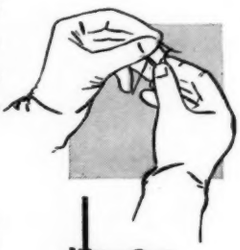

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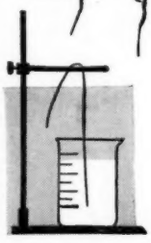

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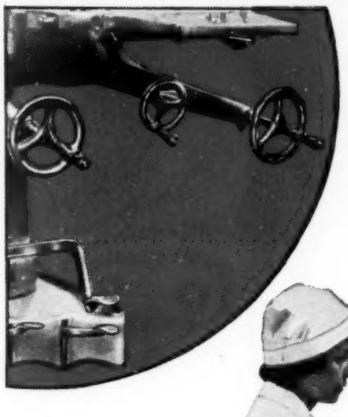

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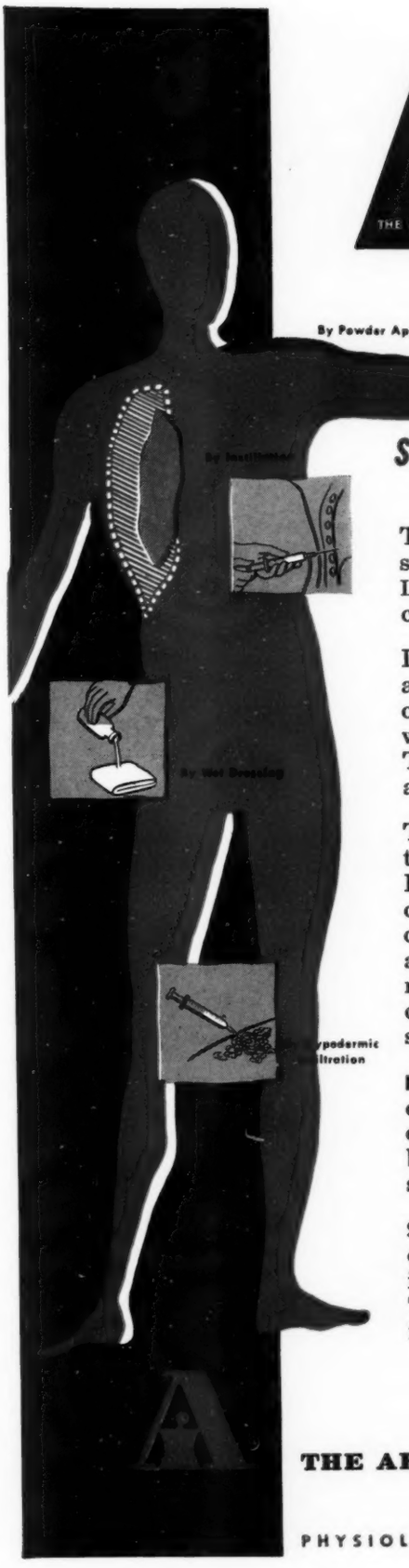


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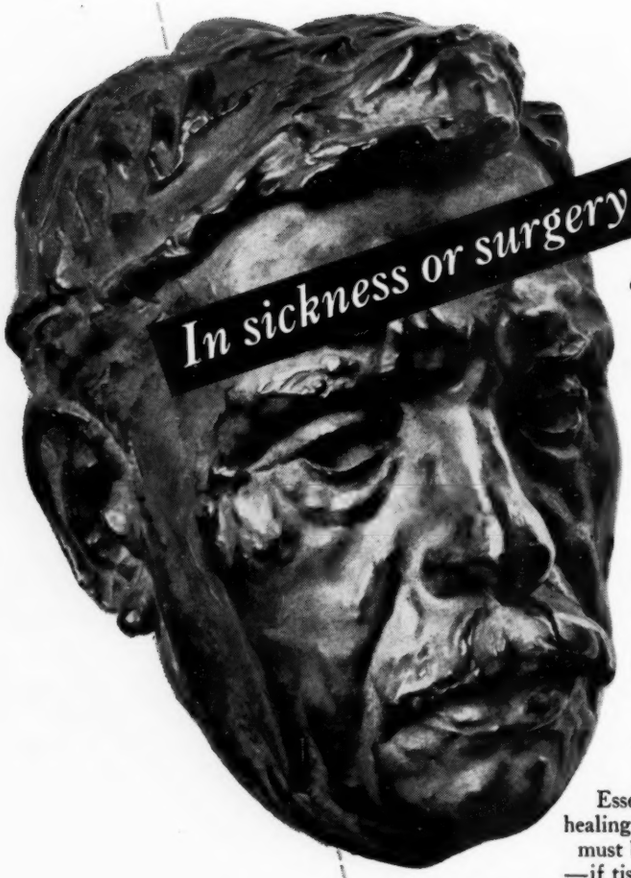

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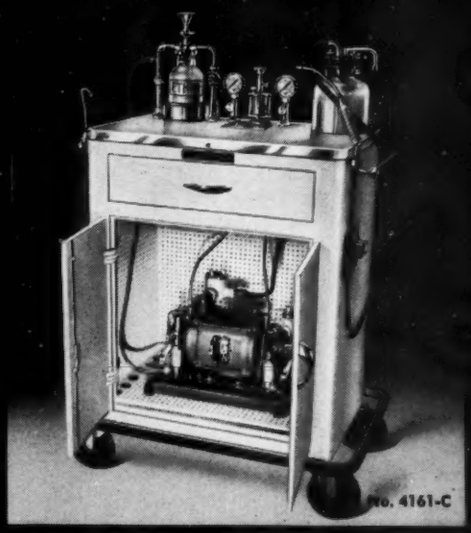


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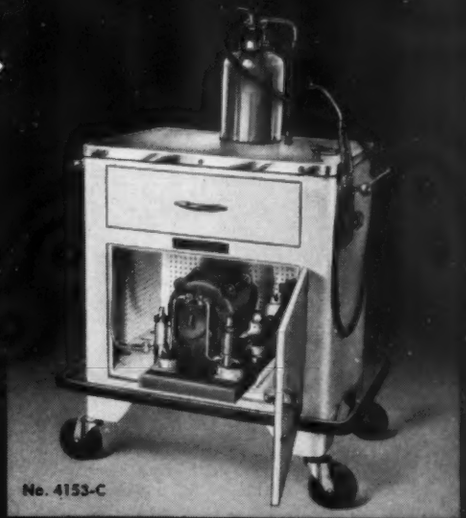


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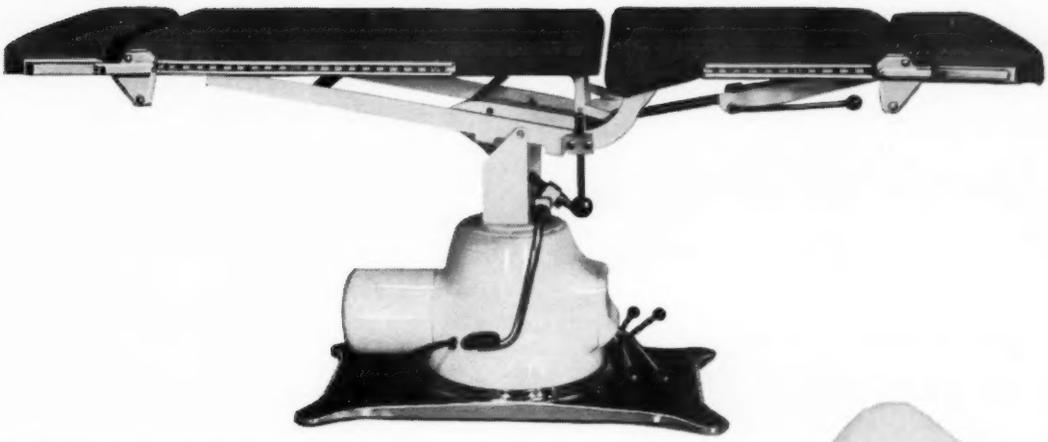
# A NEW Ritter PROCTOLOGY TABLE



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***AT THE JUNE MEETING OF THE AMERICAN PROCTOLOGIC SOCIETY***

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*Meyer, J. H.: J. Internat. Coll. Surg. 13:748, 1950.

*Literature on request*

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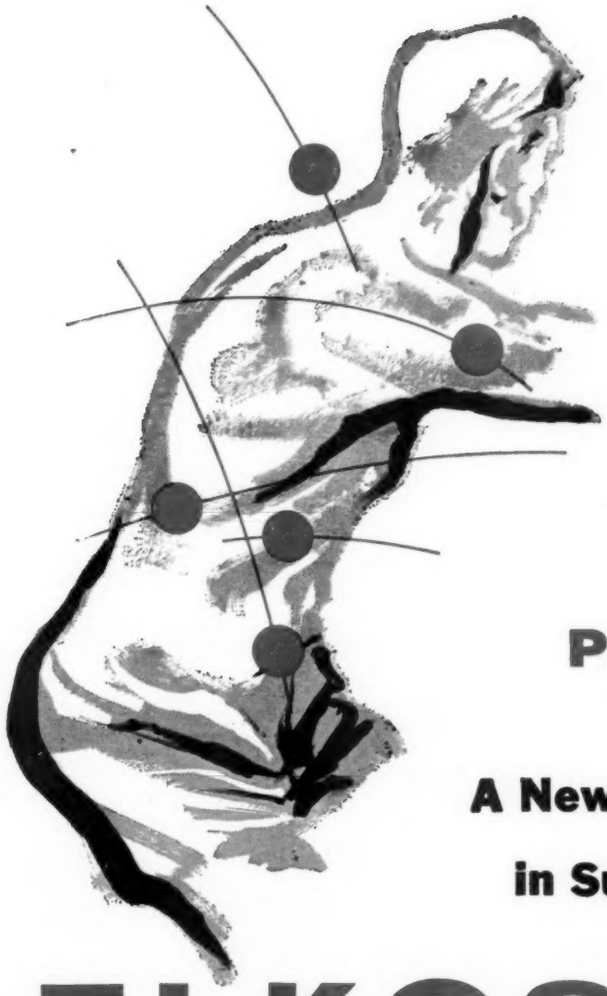

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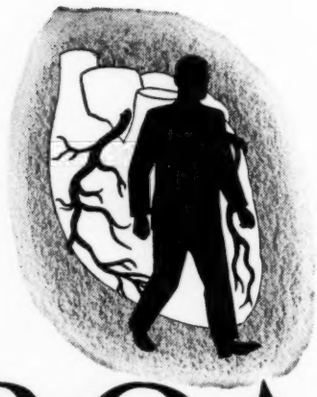

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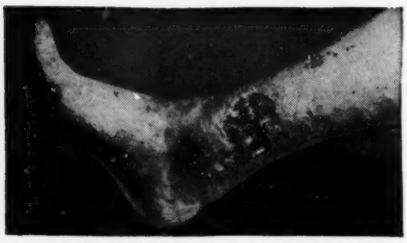

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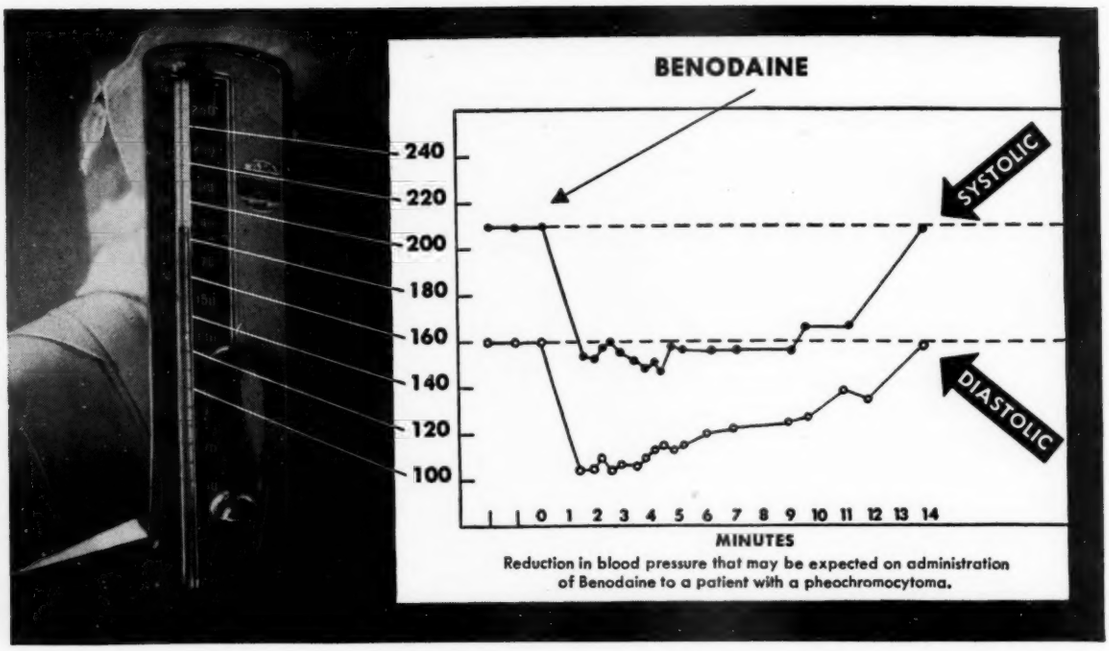


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* * *


1. Becker, M.C., Bass, R.D., and Robbins, C.M., *Postgraduate Medicine* 6:408–412, November 1949.
2. Goldenberg, M., and Aranow, H. Jr., *J.A.M.A.* **143**:1139, July 29, 1950.
3. Calkins, E., Dana, G.W., and Howard, J.E., *J.A.M.A.* **145**: 880, March 24, 1951.


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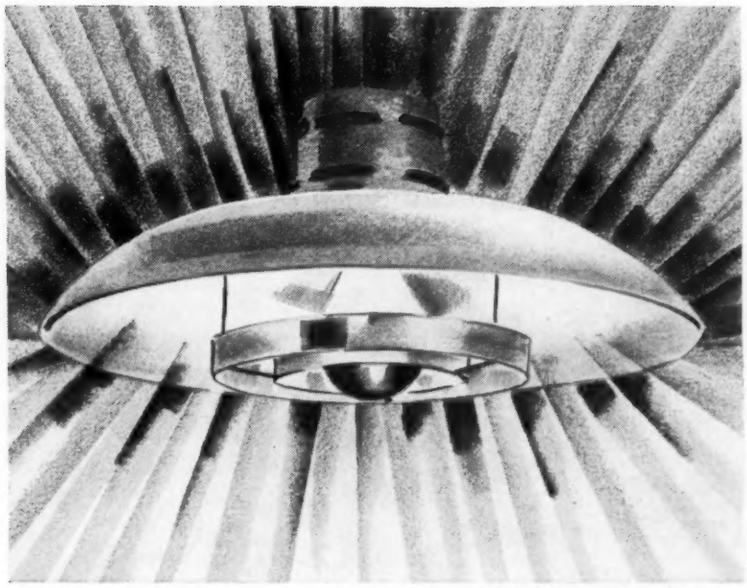

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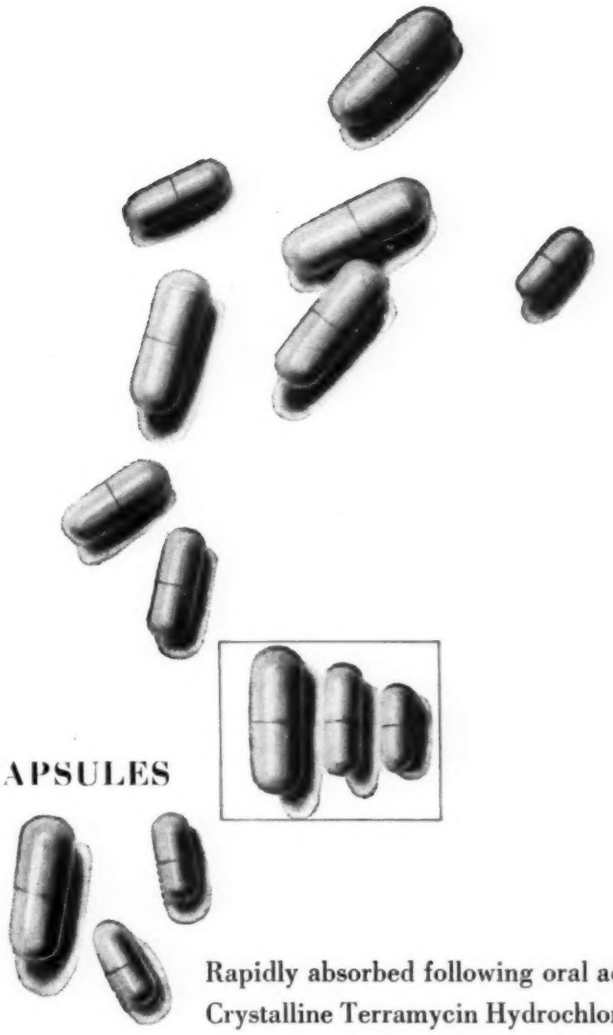

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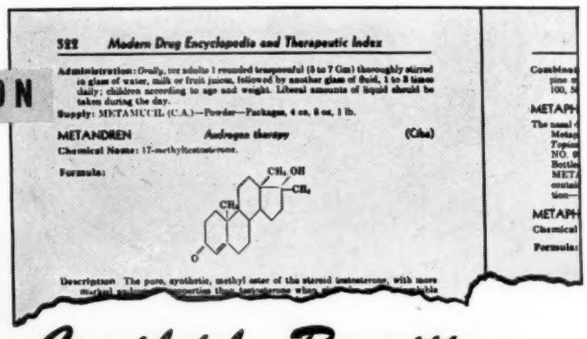
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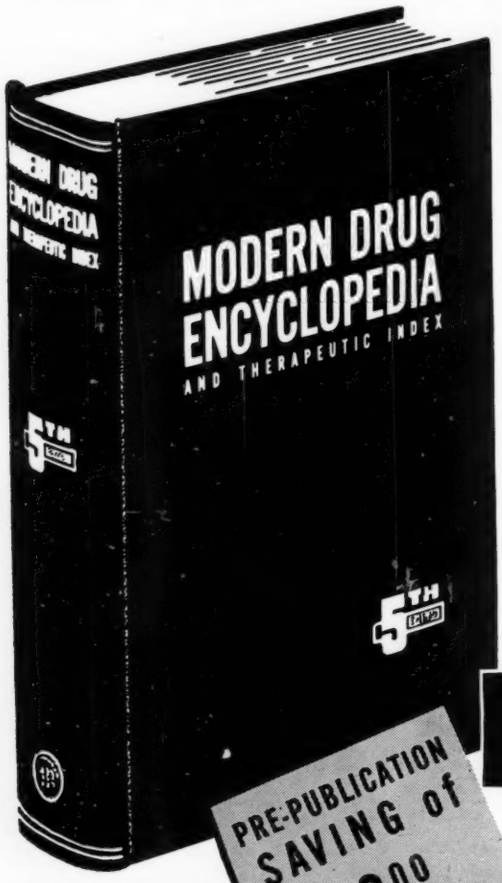


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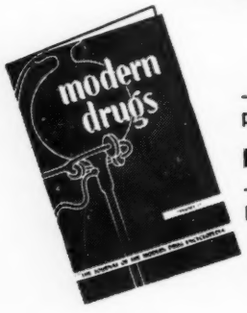


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# Nupercainal Ointment

## for prompt and prolonged relief of local pain and itching

**NUPERCAINAL OINTMENT is indicated in Hemorrhoids, Anal Fissures, Pruritus Ani, Pruritus Vulvae, Fissured Nipples, Burns, Intertrigo, Decubitus, and Nasal Furuncles.**

**NUPERCAINAL OINTMENT contains 1% Nupercaine (dibucaine) in a base of lanolin and petrolatum available in 1 oz. tubes with applicator and 1 lb. jars.**

**Ciba** PHARMACEUTICAL PRODUCTS, INC., SUMMIT, NEW JERSEY

NUPERCAINAL® NUPERCAINE® (brand of dibucaine) 2/1964M